September A McGraw-Hill Publication 20 Cents per Copy

AVIATION

The Oldest American Aeronautical Magazine

Story of THE WEEK AT *Cleveland*

A GREAT AMERICAN AIRPORT

now takes rank with CROYDON, LE BOURGET, TEMPELHOF

2500 feet CLEAR LANDING and take-off space in eight directions; 3600 feet in the direction of the prevailing wind. Field grass-covered sends them. Take off atmospheric. Natural and perfect drainage in all seasons permitting landings on any part of the field at any time.

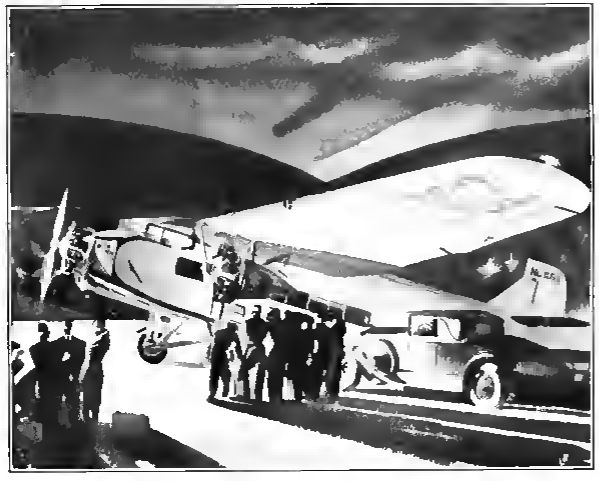
Fire-proof, heated hangars, 242½ x 132 with 20 overhead cleanance. Monodeck platforms and taxi stripe.

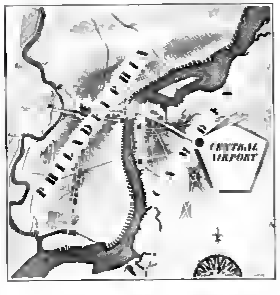
ADMINISTRATION BUILDING containing waiting rest and baggage check rooms, ticket offices, restaurant, dispensary, pilots room, operations offices, radio station, weather and observation tower.

FIVE MAIN HIGHWAYS converge at Central Airport: the White Horse Pike to Atlantic City; the Melrose Pike to Spring Lake and Lakehurst; the New Jersey State Highway to New York; Knights Avenue to center of Camden; Crescent Boulevard to Delaware River Bridge and Philadelphia business district.

NOW OPERATING at Central Airport: the first Wright Aeronautical Service Station; Curtiss Flying Services; Ludington Flying Services; distributors for Keystone, Loening, Travel Air, Waco, Fairchild and Curtiss Aircraft.

TWO SWIMMING POOLS, one for adults, one for children, adjoining the field. Parking space for more than 4000 cars.





PHILADELPHIA-CAMDEN

THERE has been no American airport to compare with Croydon, Le Bourget and Tempelhof for none has combined the essentials of strategic location, readily accessibility, adequate space and complete facilities. But today there is a new American airport ready and worthy to take its place among the finest in the world. It is the Central Airport in the Philadelphia-Camden district.

Neither Croydon nor Le Bourget are so accessible. For the Delaware River Bridge and the ten car-wide Crescent Boulevard place the Central Airport a scant fifteen minutes from the very center of Philadelphia.

Surrounding Central Airport within a radius of a hundred miles are the financial, political, industrial and pleasure capitals of the United States. Central Airport's location is perfect in its relation to business commerce and the great rail and marine transportation systems.

In area Central Airport conforms in every respect to the requirements of the Department of Commerce's highest rating. And every detail of equipment has been deliberately planned to provide the Central Airport with the most complete and modern facilities known.

Aviation men conceived Central Airport. They selected its site, financed its purchase, developed it and now own and operate it. Central Airport is not merely for local or sectional needs. It will serve the great transport lines to the West, the South, the North.

For the manufacturer and distributor of aircraft there is adjacent land for factories; space for offices and street-front showrooms; raw and manufactured materials; highly skilled, trained aviation labor; and a vast market for aircraft and flying service.

Detailed information about Central Airport will be furnished any organization requesting it. Central Airport, Inc., 538 Fidelity-Philadelphia Building, Philadelphia, Pa.

CENTRAL AIRPORT

Aviation, Sept. 7, 1929, Vol. No. 27, No. 10. Published weekly by McGraw-Hill Publishing Company, Inc., Tenth Avenue at 36th Street, New York, N. Y. Domestic $4.00 per year; Canada $5.00; All other countries $6.00. 25 cents a copy. Entered as second class matter July 31, 1918, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

KEYSTONE-LOENING AMPHIBIAN "AIR YACHT"

AMPHIBIAN TRANSPORT

By bringing the passenger closer to the centers of great cities, both on the water front and the landing field, the amphibian plane saves the minutes that often make air travel worth while. Of this type of plane, transport executives unhesitatingly select the Keystone-Loening Air Yacht for daily passenger service. It is the one amphibian that has been thoroughly proven in millions of miles of flight. Its smoothness and steadiness, its ability to ride out rough weather in the air or on the water, its cheerful, quiet cabin, its low maintenance cost—far lower than any other amphibian used in transport work—these are the results of its basically sound design and the experience gained in years of practical operation. From the Atlantic to the Pacific, from Alaska and Canada to Central America, the Keystone-Loening Air Yacht is the symbol of safe, swift, direct transportation in the service of leading air lines.

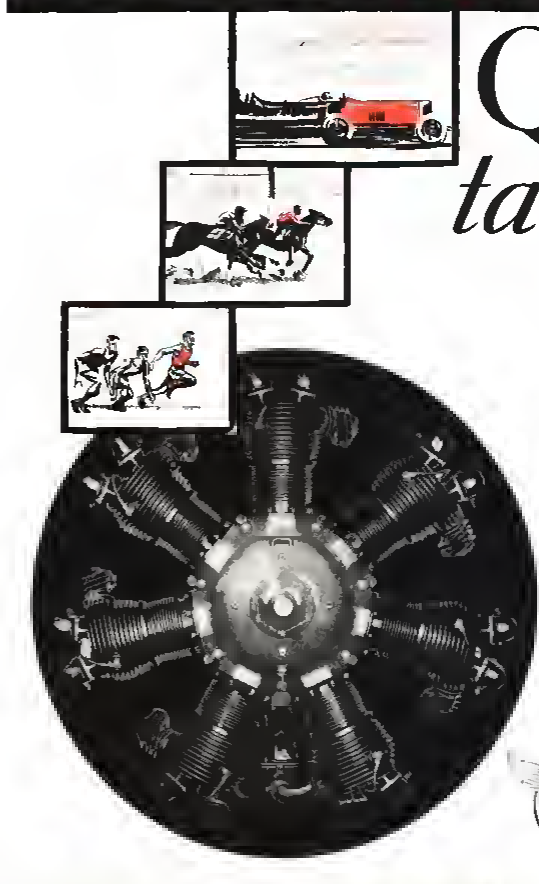
6 to 8 passengers : 525 H. P. : 100 M. P. H., Cruising . $27,900

KEYSTONE AIRCRAFT CORPORATION
SALES OFFICE.—61ST STREET AND EAST RIVER, NEW YORK
PLANTS—BRISTOL, PENNSYLVANIA, AND NEW YORK CITY

LARGE VIEW: Keystone-Loening Air Yacht on the Thompson Aeronautical Line arriving at Cleveland from Detroit.
SMALL VIEW: Passengers debarking at Cleveland.

THESE SUCCESSFUL LINES USE AIR YACHTS

American Air Express · Continental Air Service · Curtiss Flying Service · Garst Air Transport · Imperial Airways of China · International Airways of Canada · Mexican Aviation Corporation · New York and Suburban Air Lines · Pan-American Airways · Pan-American Grace Air Lines · Pittsburgh Aviation Industries · St. Louis Aviation Corporation · Thompson Aeronautical Corporation · Wedell-Williams Air Service · Western Air Express.



Quick take-off

To the Pilot . . . "powered with an Axelson" . . . means quick take-off, lightning-like acceleration, fast climbing and the thrill of ample, unfaltering power. The new Axelson illustrated Catalog featuring the improved Axelson 7-cylinder radial Engine now available to those interested in aviation.

Axelson Aircraft Engine Co.

FACTORY AND OFFICES
Cor. Randolph St., and Boyle Ave.
Los Angeles

AXELSON AIRPLANE ENGINES

CASEY JONES . President of Curtiss Flying Service. For many years one of America's foremost pilots.

Here's the whole CURTISS STORY

Read it...before you pick a flying school

In this advertisement we tell you what to expect from Curtiss Training

DO you want to learn to fly? Well then, let's talk it over. Perhaps we can give you some helpful pointers from our twenty years of experience here at Curtiss.

In the first place . . . don't go off half cocked. Your first decision is by all odds the most important.

For you've got to pick a good flying school in order to become a good pilot. Any one can learn to fly . . . only a few schools can teach you to fly *well*.

And good pilots . . . the kind aviation needs today . . . have to be *made*. They aren't just born.

We hold that thought in mind always, here at Curtiss. Our whole course is laid out with that one idea . . . to take raw material and turn out *good* pilots.

We began a long time ago. Very carefully picked out the best men we could find to be our instructors. Men of long experience in aviation.

Then we trained them to instruct students. Sent them all to a special instructors' school in Detroit. Taught them how to teach . . . how to make the fine points clear and simple to you.

We set out to parallel Army and Navy training . . . but planned it to make it practical for you in time required and in cost.

What's the result? A method that is entirely Curtiss. A method that would be impossible without the years of experience massed in this organization.

When you go up in Curtiss instruction planes you learn to fly . . . not just to push and pull on the controls.

While you are in training you meet and learn to know the men who are conducting a nation-wide business-of-the-air . . . not just a single flyer or the limited personnel of a local flying field.

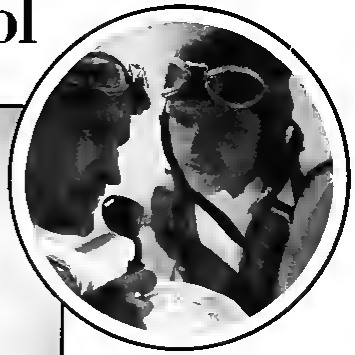
And when you graduate you are a competent flyer . . . acknowledged wherever you go . . . at home on any field . . . not just one of the thousands who can get a ship off the ground and back again.

That's why Curtiss trained pilots are in demand everywhere. Why the 1500 pilots Curtiss has turned out include the leaders in every branch of aviation.

And remember this . . . Curtiss has 40 flying schools in active operation today. All are standard and identical in their training. All are conveniently located, in the aviation centers of their districts.

If you want more complete information about them . . . more details of how Curtiss goes about making good pilots . . . fill out the coupon now.

ROAR . . . the steady drone of motors rarely dies at a Curtiss flying school. Engines warming up . . . ships in and out . . . flying all the time. ABOVE—Picture shows the modern new Curtiss Hangar at Louisville, Ky.



SOLO! No college commencement has a thrill like this! Photo shows Curtiss students watching member of their 'class' make his first solo flight. No lack of confidence here . . . early training is too thorough . . . and better equipment isn't made. Above—Note instructor and student testing head phone used at every Curtiss school to aid instruction in the air.

CURTISS FLYING SERVICE

"World's Oldest Flying Organization"

CURTISS FLYING SERVICE Dept A
27 West 57th Street, New York City

Gentlemen:

Please send me complete information about the Curtiss flying schools, their locations and an outline of the courses taught.

Name_____

Address_____

City_____ State_____

Behind each "Corsair" stands the Vought record

● *of over a decade of dominant leadership,* based on advanced engineering design, precision workmanship and the unwavering policy of producing only the finest airplanes that can be built. The performance of the Vought "Corsair" is unequalled for its type. Equipped with "Wasp" engine, it is unapproacbed in speed, climb, and all around controllability. In other words, the "Corsair" is just the plane for the sportsman pilot, the business man and the commercial operator.

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KEEPING THE MAILS MOVING

In Ohio It's ·TP· SOHIO Aero Motor Lubricating Oil

Marketed in Ohio *Exclusively by* The Standard Oil Company of Ohio

ELIMINATE faulty lubrication and you do away with an important cause of engine failure. On many miles of airways ·TP· Aero Motor Lubricating Oil keeps the engines running smoothly—helps to deliver the mails on time.

·TP· Oils are new—the latest development in scientific lubrication. They have been tested and approved by leading manufacturers of airplane engines and by many leading pilots. They are straight-run oils, not blended or compounded, produced from pure, paraffine-base crude by a process for which patents are pending.

This process has marked advantages over other methods. It removes all the paraffine wax, while preserving all the lubricating bodies in the crude. Elimination of the wax is responsible for its low cold test.

In terms of performance this means uniform viscosity at all working temperatures, minimum carbon deposit and ignition trouble from fouled spark plugs, easy cold priming, immediate oil pressure, perfect lubrication winter and summer, on the ground or at high altitudes—a maximum of safe flying hours.

A handsome, practical Pilot's Log Book sent free on request.

·TP· Aero Valve Spring Lubricant

Also ·TP· Aero Rocker Arm Lubricant

TEXAS PACIFIC COAL AND OIL COMPANY
FORT WORTH, TEXAS
New York St. Louis Los Angeles

·TP· AERO MOTOR LUBRICATING OIL

REG U S PAT OFF

Do you KNOW

1. *How to design a hangar?*
2. *What materials to use for roof and sidewalls?*
3. *How best to ventilate it, and how to daylight it?*
4. *How to prevent corrosion?*

These hangars of the United States Air Service at Lowry Field, Denver, have roofs and sidewalls of Robertson Protected Metal—a light, economical, easily-erected material that will not rust or corrode, needs no paint and involves no other maintenance expense

ROBERTSON

Has the Experience

IN WORKING with hangars—nothing succeeds like experience. But it has to be experience with the specific problems of hangars. Experience in other fields of construction does not do you much good here.

Men, inexperienced in this field, have put up hangars of unprotected metal which literally melted away in rust in a few years. Then they have put up hangars of "heavy construction" that cost so much money it will take 30 or 40 years to write them off the books.

Other men have put up hangars with little regard for the light needed in them . . . and it is almost impossible to work on planes in those hangars except with costly artificial light. Others have ignored the subject of ventilation . . . and trouble with carbon monoxide has resulted.

There are a lot of ticklish problems involved . . . and no one can possibly foresee them unless he has had the experience.

The H. H. Robertson Company DOES have the experience. It has been working with hangars since war days in France. It has worked on hangars all over the world . . . for armies, navies, for municipalities . . . for private companies and individuals. All this experience is at your command. Bring your airport problems to the Robertson engineers. Their suggestions will not cost you anything, and will not obligate you.

H. H. ROBERTSON CO. · PITTSBURGH

Boeing Transport and Berryloid AIRCRAFT FINISHES

The Yellow Shouldered Parrot suggested this brilliant combination of Loening Yellow, Boeing Green, Nungesser Green, International Orange and Alexander Blue. These are all standard Berryloid colors and they *wear.*

40 Curtiss Branches

AT THE SERVICE OF YOUR CUSTOMERS

Curtiss expert mechanics—carefully selected and trained men—in part of the nation-wide Curtiss organization that can help you and your customers

Nation-wide Chain proving indispensable to Curtiss dealers

NO matter where you are, there's a Curtiss unit within reasonable flying distance of your field. And that means a branch that's fully equipped and manned to meet any need or emergency your customers may have.

New planes—new parts—a full line of accessories—full service is waiting for them and for you—in most cases less than 3 air hours away.

And remember, there is no other company that gives you such a range of planes and motors to meet the demand of any customer. There is a plane for every use—for every purse—in the Curtiss line—and the superior quality of Curtiss equipment needs no introduction to your prospects as you know well.

The Curtiss Louisville, Kentucky, hangar—a modern and complete unit, one of forty Curtiss branches that gives outstanding service and accommodations

Naturally, this nation-wide service is a valuable sales point for you. Wherever your customer goes he will find a Curtiss branch or dealer to give prompt and complete service. His ship is never an "orphan", no matter where he takes it.

There are 85 dealers today with Curtiss and more are joining weekly. Meet the manager of the nearest Curtiss Branch now and let him tell you the full story of Curtiss dealer policy. Or full information will be given you upon request immediately. Curtiss Flying Service, Dept. 25, 27 West 57th Street, New York City.

CURTISS FLYING SERVICE

Sales agent for

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Cessna Aircraft Co.
Curtiss Aeroplane and Motor Co., Inc.
Ireland Aircraft, Inc.
Command Aire, Inc.
Moth Aircraft Corp.
Aircraft Service and Accessories
Airport Lighting Equipment

Operations

Aerial Transportation
Aerial Photographic Surveys
Agricultural Dusting
Flying Schools

CURTISS FLYING SERVICE

"World's Oldest Flying Organization"

3 PLANES *provide 230 hours'* instruction in thirty days

Westchester Airport Corporation, Armonk, N. Y., recently purchased six Fairchild KR 34s with Wright engines. One was sold immediately and another is in sales stock. These are used daily for student training and hops. The sixth is held in reserve.

D. J. BARRETT, Jr., of Westchester Airport, believes in training students in modern ships. "The kind they will want to buy and you will want to sell," he says. And so, this summer, he switched to Fairchild KR 34s. In the first month's operation his three regular Fairchild KR training ships had 107 hours, 68 hours and 55 hours respectively in the air. His relief instruction ship has scarcely been needed.

"They are fine ships," says Mr. Barrett. "It is not unusual for us to use them six hours a day for instruction. They handle well. The pilots like them. The students like them. Just one little point, for example. By throttling back only slightly you can talk between the cockpits without shouting.

"One great advantage for the operator in the three-place Fairchild KR 34 is that you can use these ships also for hops and taxi work. For this service, we simply remove the controls from the front cockpit and go. That doubles the value of the equipment without extra expense."

* * *

Let us tell you the whole story of the Fairchild KR 34 and other fine airplanes in this line. Write us for new catalog.

FAIRCHILD AIRPLANE MANUFACTURING CORPORATION
FARMINGDALE L. I. NEW YORK

Plants: Farmingdale N. Y. Hagerstown Md. Longueuil P. Q. Canada

District Offices
332 S. Michigan Ave., Chicago; 2100 N. Harwood St., Dallas;
756 E. 11th St., Los Angeles. *In Canada*: Fairchild Aircraft Ltd.,
505 Confederation Bldg., Montreal, P. Q.

FAIRCHILD

KR AIRPLANES

Curtiss sets Dramatic 420 hours

Challenger Engine functioning perfectly when Robin lands on Eighteenth Day

420 hours in the air! Long enough to travel completely around the world!

173 hours longer than any aircraft had ever remained aloft . . . and still functioning perfectly when pilots reluctantly landed on the eighteenth day!

What greater test of performance . . . of the mechanical perfection of its products . . . could Curtiss offer to the world of aviation?

For it's a new engine . . . barely six months in production . . . another link in the long chain of Curtiss products . . . that further proves the inestimable value of Curtiss' 20 years aviation experience . . . of Curtiss' ability to build both plane and engine that are leaders in their field

Stock model plane and engine

And remember! The record-breaking "St. Louis Robin" is a stock model Curtiss Challenger-Robin . . . it differs in no way from the standard plane you can buy from any Curtiss dealer!

Jackson and O'Brine needed a power plane with unusual powers of endurance . . . A plane and engine that would function perfectly with a minimum of attention!

They found the qualities of comfort, sturdiness and innate stability they needed . . . in the Curtiss Robin . . . and the unbelievable powers of endurance they absolutely had to have . . . in the Curtiss Challenger engine!

And the same qualities have made the Challenger first choice among an increasing group of Curtiss enthusiasts. Have made it one of the most popular engines made for commercial or pleasure flying.

Curtiss country-wide service

And with all its other advantages . . . the Challenger-Robin has behind it a system of service that no other plane or engine can offer . . .

If you fly a Curtiss ship or have a Curtiss engine in your plane . . . you are always within easy flying distance of complete repair, parts, and accessory service.

For the Curtiss country-wide organization has blanketed the airways from coast to coast with 40 service stations and over 85 dealers. And remember, too, that the Curtiss line covers planes and motors of every type for every purse.

Wire or write and we will immediately tell you the nearest point at which you can see and fly a Challenger-Robin. **Curtiss Flying Service, Dept. 16, 27 West 57th Street, New York City.**

Sales agents for Curtiss-Robertson Airplane Mfg. Co., Cessna Aircraft Co., Curtiss Aeroplane and Motor Co., Incorporated, Ireland Aircraft, Inc., Command-Aire, Inc., Moth Aircraft Corp.

AT LEFT
"Grooming" the Challenger engine just before the start of its history making flight.

ABOVE LEFT
One of the 47 refueling contacts in the dramatic flight. The stability of the two Challenger-Robins was a big factor in the success of this dangerous operation.

CURTISS

Endurance Record . . . in the Air

Curtiss products—too! Forest O'Brine (top) and Dale Jackson (bottom) . . . co-pilots of the St. Louis Robin.

Both of these men are members of the Curtiss nation-wide organization.

Daily, under all conditions, Dale Jackson went out on this precarious "cat-walk" to inspect and tune up the Challenger engine . . . the pivotal member of the now famous quartet of Jackson, O'Brine, Robin and Challenger. Dramatic close-up shot made high in air on fifteenth day of flight.

FLYING SERVICE

"World's Oldest Flying Organization"

JUST as the Glenn L. Martin organization pioneered in the solution of mastery of the air, it is now pledged to pioneer in perfecting new contributions to the art of aeronautics.

THE GLENN L. MARTIN CO.
Builders of Quality Aircraft since 1909
BALTIMORE · MARYLAND

Cook's Paints Exclusively

for all Swallow Planes

Behind this letter from America's oldest builder of commercial airplanes, is the exceptional knowledge of materials and methods that has come from years of practical experience and thorough testing. It was this knowledge and experience that dictated Cook's Paints exclusively—for all Swallow planes.

Cook's Armorcote Fabric Finish for its colorful, gloss-like, air-smooth, *durable* protective coating. This light-weight, tough, elastic, non-cracking, perfect leveling finish is available in 30 standard colors.

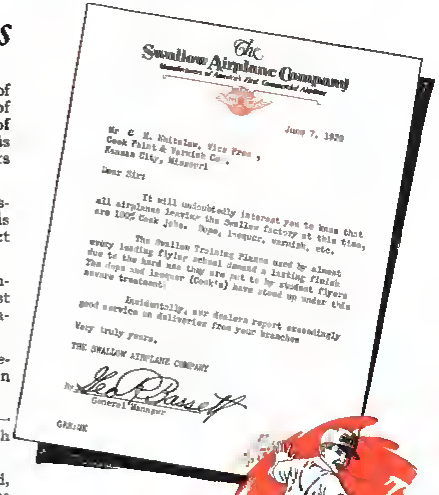
Cook's Airplane Dope Clear—that excellent non-blushing fabric dope that is balanced to produce just the right degree of tautness, fill and ease of application.

Cook's Metal Decorative Lacquer—a remarkable *one-coat* metal finish made in Cook's 30 standard aviation equipment colors.

Cook's Chilinoil (Chi-lin-oil) Interior Tube Coating—a full-bodied, quick-drying protective coating which withstands exposure indefinitely.

Cook's make a finish for every plane and airport need, including dope-proof primers and varnishes, as well as a complete line of pigmented and semi-pigmented dopes.

Write for the whole Cook Finishing Plan.


The Swallow Airplane Company
Manufacturers of America's First Commercial Airplane

June 7, 1929

Mr. C. H. Whitelaw, Vice Pres.,
Cook Paint & Varnish Co.,
Kansas City, Missouri

Dear Sir:

It will undoubtedly interest you to know that all airplanes leaving the Swallow factory at this time, are using Cook paints, dope, lacquer, varnish, etc.

The Swallow training planes used by almost every leading flying school demand a lasting finish due to the hard use they are put to by student flyers. The dope and lacquer (Cook's) have stood up under this severe treatment.

Incidentally, our dealers report exceedingly good service on deliveries from your branches.

Very truly yours,

THE SWALLOW AIRPLANE COMPANY

By W. E. Russell
General Manager

GRH:MK

COOK PAINT & VARNISH COMPANY

Aviation Division: 2426 North Broadway, St. Louis, Mo.

FACTORIES AT: KANSAS CITY, ST. LOUIS, FORT WORTH, HOUSTON, CINCINNATI

AVIATION

The Oldest American Aeronautical Magazine

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R. SIDNEY ROWEN, JR., *Associate Editor*

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September 7, 1929
VOLUME 25 NUMBER 10

McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Avenue at 36th Street, New York, N. Y.
Cable Address: Mechanist, N. Y.

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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A McGRAW-HILL PUBLICATION — ESTABLISHED 1916

EDWARD P. WARNER, *Editor*

VOLUME 27 . . . *September 7, 1929* . . . NUMBER 10

Civilian Stunting

IT IS TOO EARLY to make any full and final appraisal of the Cleveland Races and their results. It is not too soon to give an enthusiastic approval of the general effect. The management deserves great praise, both for the program as a whole and for the arrangements for handling the crowd, but there was one event, almost daily repeated, upon which we can only bestow unreserved condemnation.

Each afternoon stunting teams of civilian pilots in aircraft of commercial types went forth to display their prowess. The piloting was splendid. The machines used proved their structural strength and their maneuverability. The crowd was thrilled almost as much as by the military formation flying. The spectacle was one which had absolutely no place at the National Air Races, and we hope that it will never again be seen there.

As a demonstration of the capacities of an airplane for the benefit of a prospective purchaser who is already a pilot and is well acquainted with the general behavior of aircraft in flight, acrobatic flying has much to recommend it. It is a proper part of any such demonstration of a light sport machine designed to stand rough handling. As a demonstration of the usefulness of aviation and the general capabilities of aircraft before a crowd 99 per cent of whom are not pilots and a majority of whom probably never have even flown as passengers, it rates below absolute zero. When a string of outside loops is made, those who fly themselves may understand and admire, but each succeeding inverted flip-flop adds to the number of lay spectators who solemnly resolve that they will take all their aviation henceforth at second hand and at a safe distance. "If that sort of thing is a part of flying," is the consensus, "instinct tells me that it cannot be much fun."

One afternoon, following aerial exhibitions which included the extreme in aerobatics, the race announcer asked that all who had been up in a plane raise their hands. Perhaps one-quarter of those assembled indicated that they had taken flights. The announcer then asked that all planning to take rides after witnessing the afternoon's exhibition raise hands. The additions were scanty.

It is difficult to blame either the pilots or the manufacturing companies taking part in stunting displays. Competition operates there as elsewhere, and if one commercial machine is to startle the crowd by lurid evolutions, rival manufacturers are naturally eager to prove that their products can do the same. Only by co-operative action can the evil be met. We urge it upon the commercial manufacturers' section of the Aeronautical Chamber of Commerce, with all the force at our command, that they jointly agree that stunting exhibitions on these public occasions are opposed to the interest of the airplane industry and that they pledge all their members to refrain from participation. We urge that the Department of Commerce use its good offices to the same end, and that the National Aeronautic Association do its best to discourage anything in the nature of stunting contests at sanctioned meets.

The idea of using aircraft as vehicles has to be sold to a large and stolid and naturally somewhat timid public that has not yet been touched. Mass action to discourage aerial acrobatics is one of the obviously necessary steps to that end.

//

The Ladies Come Through

WHEN THE PLAN for a women's air derby was announced, there were many doubters. Metropolitan newspapers joined with individuals both in the aeronautic industry and outside in pessimistic forecasts of disaster and of a distressing public reaction.

Well, the derby has been run, and it was worth while. Despite the tragedy which shadowed its early stages, disheartening as fatal accidents always are, the event rates as a success. Where six months ago there were but three or four women in America who held the transport license, it was possible last month to assemble in San Diego a score of feminine pilots who could satisfy the contest committee that they were qualified for the event,

and two-thirds of them came through to the finish over a course of more than two thousand miles That certain of the entrants were very limited in solo cross country experience or in any kind of experience with machines of the type that they flew in the race frankly caused some of us great alarm in the first days of the competition That they came through to the finish successfully in spite of those limitations stands, now that the event is over, as a testimonial to their natural aptitude for flying

It would have been easy for the women's derby to become a sort of an annex to Hollywood That it did not, and that unpleasant incidents were few, is a tribute to the good sense and seriousness both of the managers and of the contestants. It will still be easy to err in the future If there are to be repetitions of the women's events, both cross-country and closed-circuit, which have been held in connection with Cleveland's gala week, and we take it for granted that there will be, they must be conducted with the mechanics to the fore and the publicity men very much in the background The safety of the contestants demands that and so does any sound promotion of aviation as a sport Rules should be stiffened up, rather than relaxed. Over-confident novices must be protected against themselves This year's trial was frankly an experiment. The women who started at Santa Monica on August 18 and finished at Cleveland on August 26 taking them as a whole, set a good example for their successors

//

The Saratoga Goes on the Night Shift

IT IS OUR REGULAR POLICY to allude to military and naval happenings only so far as they directly affect the aircraft industry We undertake no general treatments of military policy, and no political arguments. In the recent accomplishment of the aircraft carrier Saratoga in making repeated landings aboard at night by the sole aid of a few lights placed on the deck of the ship, however, there is nothing political Even though the accomplishment is an essentially military one, and even though a proper military secrecy on aircraft carrier operations prevents discussion of the details of the method, we cannot withhold our enthusiastic admiration It is difficult to realize without having been on board an aircraft carrier the extreme delicacy of technique required to land on board a moving ship rolling and pitching as it travels through the sea The action of the pilot and the action of those on the deck must be so harmonious that their minds work as one The difficulty of the problem is infintely greater when the ship and its surroundings are not visible as a whole during the approach

Although there is no apparent immediate commercial use for the experience so gained, the provision of landing decks on a commercial liner has at least once been seriously considered in preparing plans, and is likely to become a live issue again. In any case, however, and whether or not commercial airplane carriers are built, the landings made on the Saratoga at night serve as a fresh reminder to the general public that night flying has become a commonplace thing. Even after five years of successful night air mail operation a non-piloting passenger may still regard with some terror the idea of having to get down in a comparatively strange and dimly lighted field after dark. The knowledge that safe landings can be made in darkness on so unstable a surface as the swaying deck of a ship should do much to encourage him The officers of the Saratoga, as well as the high command of the Battle Fleet Aircraft Squadrons and of Naval aeronautics in general, are entitled not only to the warm congratulations but to the thanks of civilian aeronautical interests for this demonstration

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A Wise Precaution

PARACHUTES have been required of all participants in the air derbies, and are strongly urged for participants in all the other National Air Race events as well It is our impression that this is the first time that such action has been taken by the National Air Race sponsors

They have assumed a most commendable stand, and we say this notwithstanding the fact that one attempt appears to have been made to use a parachute from too low an altitude to permit of its functioning Modern parachutes have been developed to unquestioned reliability and their ordinary value is heightened under conditions of more or less acute congestion, such as are bound to exist during the gathering at Cleveland Adherence to the Air Race Committee's request may not actually have any effect in any particular event There may be no occasion to use parachutes Still, no reasonably available safeguard should be neglected

Unfortunately, the National Races have been held at the cost of several lives in past years Unfortunately, too circumstances attending some of the accidents would have made every safety device, including the parachute, of no avail. However, the normal arguments for the use of parachutes gain in impressiveness at a time when additional risks, such as exist in racing, are assumed

There still exists on the part of some good pilots a prejudice against parachutes under any circumstances Their attitude is hard to understand Aircraft in general are far safer now than ten years ago, and there are many operations in which the prospect of needing a parachute or being able to use it successfully is so slight as not to justify the added weight and inconvenience, but where the parachute narrows down appreciably a real risk we are strongly in favor of it whether in commercial or sporting pursuits Cross-country racing and much closed-circuit racing as well, falls in that category It is to be hoped that the recommendation of the National Air Race committee was generally followed and that it will establish a standard practice for the future

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Free-for-All Racing

FOR THE FIRST TIME in several years the free-for-all at Cleveland was true to its name The old rule against pitting military and civil pilots against each other, which has stood for five years or more, has been laid aside We hope it will never return

It is not the policy of the War and Navy Departments so much as it is general conditions that have changed Two years ago the industry had neither the resources nor the inclination to build for racing

A civilian victory at Cleveland furnished the best of evidence that the commercial builder can enter against unrestricted competition, and can sometimes win It gives his engineers an interesting exercise, and spurs them to new effort which may later reflect itself in the stock machine put into production Is it worth while?

So long as the racing is taken no more seriously than at Cleveland, it is well worth doing The military machines competing there were straight pursuit types The non-military entries, though hardly suitable for transport, were not so specialized nor so inherently expensive as to fail of appeal to a small but growing class of wealthy young men who seek extreme performance in a sport machine Everyone got experience The prize-winners got valuable advertising for machines at least approximating commercially saleable types

The danger is that we shall not stop here "Free-for-all" is a far-reaching term One Schneider Race is enough for the encouragement of design for unlimited speed As competition grows keener the temptation is to put landing speeds up and up, to trim down cockpit openings, to sacrifice safety, vision, durability, everything else to the quest for miles per hour The end is the vain pouring out of money upon racing planes having no other possible use, and a withdrawal of the airplane industry from the speed course as the automobile industry, taken as a whole, has withdrawn from the track. Before next year there should be evolved some formula that will insure some practical utility in the planes entered Limitation on engine displacement alone will not do There are various attractive possibilities but we do not attempt at the moment to discriminate among them. We do urge that the matter receive early study, to the end that building for races and entering them may continue to be worth the industry's while

Nine Starts . . . Eight Successes . . . No Disasters

THE HEADLINE tells the story The very simplicity of the statistical statement of the rigid airship's Trans-Atlantic performance is impressive It needs no embellishment The wonderful flight around the world, just completed, was hardly required to prove the case. The crossing of the Siberian wastes and of the North Pacific comes as a super-demonstration There is no urgent need at present for continuous round-the-world airship service, but a craft that can perform such a trip with such neatness and apparent ease inspires new confidence in its capacities for consistent travel on regular routes of more modest length

Travel by airship between America and Europe has become a normal thing like traveling by airplane between Los Angeles and San Francisco The passenger list of the Graf Zeppelin includes the names of business men who are there not because of any burning love for airships but solely because their affairs require their presence on the other side of the Atlantic with a minimum loss of time They would be vexed if there were any delay, either in starting or in arrival The whole world would be astonished at anything worse than delay. Success is taken for granted In proportion as the airship ceases to be a vehicle of romance, it is becoming a vehicle of transportation

The smoothness and uniformity with which the Graf Zeppelin has been shuttling across the Atlantic reinforced by a circumnavigation of the globe in 21 days and seven hours total elapsed time, with only twelve days of actual flying time, furnishes a noticeable contrast to the variegated record of trans-oceanic operation with heavier-than-air craft The airship on the other hand would undoubtedly score a deplorable failure on certain short inland routes which the airplane now serves with regularity and efficiency Never has it been more evident that the friends of both types will be guilty of outrageous folly if they treat each other as enemies in a war of extermination Airplane and airship need each other's backing They operate in different fields with a substantial amount of overlap to be sure, but with not enough to make them primarily competitive In choosing aircraft for transport we may well adopt as a motto, though with changed application and different purpose, the first part of the Socialist creed—"From each according to its ability." "The forces of nature," said the great Count Zeppelin, from whose undaunted spirit the rigid airship emerged and whose name is borne by this, the latest of the line, "cannot be eliminated, but they can be balanced against each other." We shall be wise to choose the particular type of balance and the craft that does the balancing, with due reference to the nature of the particular forces to be met Let us have no dogmatic devotion to standardized solutions for our aerial problems

Technical Aspects OF THE CLEVELAND EXPOSITION

By Leslie E. Neville

AN ANALYSIS of the exhibits at the National Aeronautic Exposition, held August 24 to September 2 at the Cleveland Public Auditorium, is helpful in noting the most recent tendencies in airplane and engine design. Although the airplanes in the exposition hall were fewer in number than those at some of the previous shows, the group was representative of the present status of the American aeronautical industry.

The Cleveland auditorium is exceptionally well adapted to any type of exhibit, particularly one of airplanes and both city and show management are to be commended on their forethought and consideration in making preparations for the display. Unfortunately the attendance was somewhat below standard but this was more than counterbalanced by the record showing at the airport. There is probably some question as to the advisability of conducting an aircraft show at the same time as the air races and at so great a distance from these activities.

As to the presentation of the exhibits most of them were attractively arranged and well spaced and balanced. Decorations were simple but pleasing. Several companies showed uncovered fuselage structures and one cut-away engine was displayed. It is regretted, however, that there were not more exhibits of this type and it is hoped that American manufacturers will realize the value of such displays as shown by the European expositions.

One of the early Wright biplanes and the two-cylinder Lawrance engine, from which the Wright Whirlwind was evolved, lent an historic aspect to the exposition.

Probably the dominating theme of the exhibit was the response of designers to the demands for increased performance in all classes of airplanes and most of the developments seen could be attributed directly or indirectly to this. This design trend was reflected also in the engine and accessory exhibits.

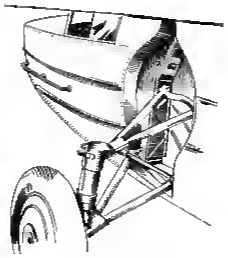
Increased performance depends in general upon two factors, greater power and cleaner design from an aerodynamic standpoint, and most of the airplanes exhibited showed evidence of development in one or both of these. Increasing power is limited of course by the engines available in a given range while that of increasing aerodynamic efficiency is to a great extent a problem of decreasing drag.

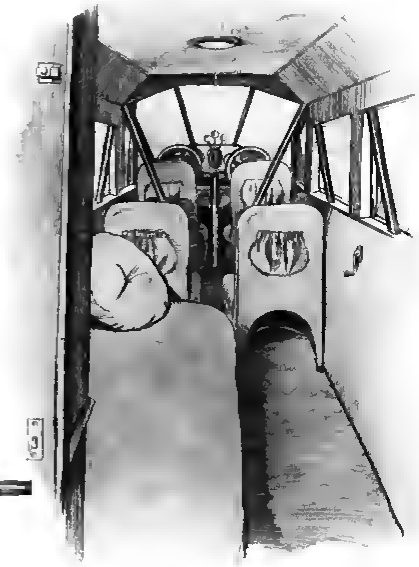
ENGINE MANUFACTURERS are rising to meet the demand of the airplane manufacturers in this respect and the plane manufacturers are adapting their designs to the engines of greater power as rapidly as it is practicable. The engine designers are striving not only to produce power plants of greater output but are also attempting to conform with the plane manufacturers' efforts by designing engines of lower frontal area and therefore less resistance. It is interesting to note that this was the first aircraft show at which no airplanes powered with the Curtiss OX-5 engine were exhibited.

Among the design features contributing to aerodynamic efficiency were cowlings of the N.A.C.A. type, streamlined fairings of several distinct types for landing wheels, fillets to streamline wing panels and empennage members into fuselage, fuselages of circular or elliptical section, cantilever and retractable landing gears and landing lights. Tapered wings were not as much in evidence as at previous shows probably because of the difficulties involved in their manufacture.

A number of the aircraft at the Cleveland show were equipped with cowlings of the N.A.C.A. type but no standardized interior design seems to have become

The Irvin Cirrus powered Great Lakes Amphibian with detail sketch of retractable landing gear mechanism

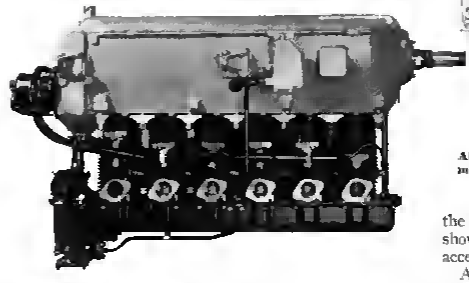




Above: A sketch of the interior of the Travel Air cabin monoplane. Left: The new Curtiss 'Conqueror' six cylinder in line inverted air cooled engine rated at 520 hp.

accepted. The practice of building these cowlings in halves so as to permit of removal without disturbing the propeller is quite general but none of these installations were provided with any means of adjusting the size of the annular opening at the rear.

Streamlined landing wheel fairings have become quite general judging by the number of airplanes equipped with them at the auditorium and on the field. The prevailing type was a faired shroud covering as much of the wheel as practicable, constructed of steel tubing or strip and covered with fabric. One exception found on a Monocoupe plane, was a fairing of modified conical shape fastened by metal strips just behind the wheel. The average weight of these single units is approximately 4 lb.



More airplanes than at any previous show were fitted with fillets to fair the attachment of wing and fuselage and, in one case, these fillets were used to provide a portion of the space for the fuel tanks, which also extended into both wing roots.

The difference of opinion of designers as to the desirability of increasing efficiency by the use of various types of fuselage sections is still in evidence. Where some of the new fuselage designs at the Detroit show indicated an attempt to derive a certain amount of lift from this unit, those at the Cleveland show seemed to suggest an effort to reduce drag by the use of elliptical transverse sections.

While it is not new, the cantilever landing gear of the General Aristocrat and Cadet sportabout seems worthy of mention and it is also interesting to note that the retractable landing gear of the Eaglerock "Bullet" has been somewhat redesigned. The principal modification is in the direction of travel of the wheel bearers which is now fore-and-aft.

A large number of low drag landing lights, both of the built-in-the-wing type and the retractable type were shown, some installed on airplanes and others among the accessory exhibits.

An inverted and an eight-cylinder oppose type of engine, both intended to facilitate streamlining and increase visibility in airplane designs were shown and will be discussed in detail later.

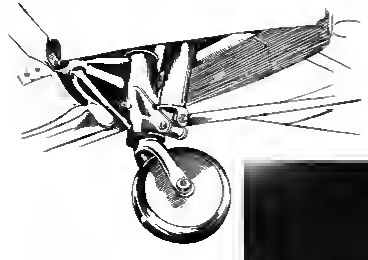
CONSIDERING the airplanes at the show from the structural standpoint, the progress of metal construction is still noticeable as it was in Detroit last April and welded steel tubing remains conventional practice in fuselage construction while the majority of wing structures are still made of wood. Fabric remains the favored structural material but a large proportion of the new designs at Cleveland employed plywood covering. There were no wing structures of welded steel tubing and none of steel and aluminum alloy construction but there were several of wood and aluminum alloy.

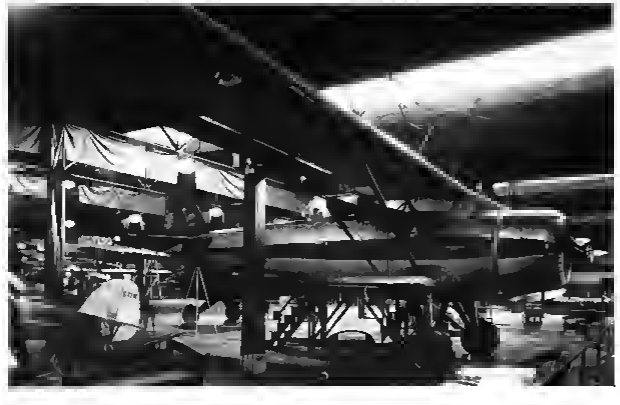
There seems to be an inclination on the part of designers to separate the pilot from the passengers in closed airplanes intended for a single pilot. This idea has its advantages but it would be a decided disadvantage if for any reason the pilot was incapacitated and no one could take the controls in time to avert disaster. One design at each of the last two shows has had engines built into the wings. Some progress is being made toward solution of the visibility problem, but there is still much to be done in this direction.

With the increasing number of light training planes several problems seem to have arisen. Economy dictates that one set of instruments should be sufficient for pilot

and student and this is solved automatically in planes of this type having side by side seating arrangement. These appear to be in the minority, however, and various devices have been developed to meet this end and to permit of closer communication possibilities between student and pilot in the tandem seating types.

One of the first of these was the single cutout for tandem seating arrangement. This was not in evidence in any of the airplanes at the Cleveland show, and it is interesting to note that one manufacturer whose design





Above — Sketch of the tail wheel and shock absorber construction of the General Mailplane. Right—The Mailplane as it was exhibited at Cleveland. Lower right—A sketch showing the combination exhaust silencer and heater on the lower portion of the fuselage of the airplane, which is powered with the Geared Hornet engine

was characterized by such an arrangement has discarded it entirely, made two separate cockpits and provided a small glass windshield for the rear cockpit.

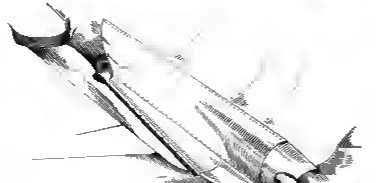
In some cases no instruments are provided for the student as standard equipment. Other training planes have the necessary instruments mounted above the cockpit cowling and in one effective installation, the instrument panel was built into a cutout in the center section. This also affords vision above.

Most of the training planes now have detachable sticks to avoid the dangers resulting from student "freezing" and a detachable rudder bar was shown as part of the equipment of the Swallow TP.

Tail wheels, brakes and oleo shock absorbing mechanism are a general combination on private and some commercial planes, while those of the general purpose types may be equipped with these devices at the option of the purchaser. Although propeller equipment is usually optional the airplanes at the show were about evenly divided as to wood and metal types. No steerable tail skids or wheels were noted at the exposition. Parachute seats also are coming into more general use.

Few changes have been made in the general design of landing gears but several designers are using wing stubs to obtain greater strength. A new tripod type of landing gear has been developed by the Waco Aircraft Company and is being used on all of its planes. The external and internal appearance and finishes of airplanes seem to be following automobile practice closely. This also applies to interior hardware and instrument equipment.

In point of numbers, monoplanes predominated over biplanes at the Cleveland show. Comparing this exposition with that held in Detroit, the proportion of three engined planes at Cleveland was far greater. This was due, of course, to the addition of the Boeing Model 80-A in the transport class and the Hise Monoplane in the medium weight tri-engined class. The fact that two medium weight tri-engined planes were shown indicates that designers are still interested in that type. Many of the new designs are low and center wing types, and a number of planes of this type are offered for training purposes. The demand for a small amphibian for private



use is also being met by designers according to indications at Cleveland. A comparison of the Detroit and Cleveland shows regarding numbers of the various types exhibited is shown in Table 2.

An analysis of the airplanes exhibited on a basis of gross weight also is interesting. Beginning with the weight range under 1,000 lb., two planes were represented, both being of the single seater light type and both monoplanes. It is significant to note that the 1,000-2,000 lb. range had the greatest representation in point of numbers. Seventeen of these (all of the two place

type) were exhibited and the majority of them were intended for training purposes. Sixteen airplanes in the 2,000-3,000 lb. range were displayed and this is the first exposition at which there were fewer of these planes than those of the 1,000-2,000 lb. class. There was a smaller proportion of biplanes of the well-known three place general purpose type in the 2,000-3,000 lb. class, indicating that this type has been supplanted to some extent by the two place type of similar design and also that the needs of airplane purchasers have become more clearly defined.

Both of the amphibians and both of the medium weight tri-engined planes fall into the fourth range of 3,000 to 4,500 lb., of which there were eleven. The land planes in this class are largely of the six place type. Only one of these planes was a biplane.

The fifth class ranging from 4,500-6,500 lb. was represented by six planes of the single engined mail and transport type. Four of the six were monoplanes, one a biplane and one a sesquiplane.

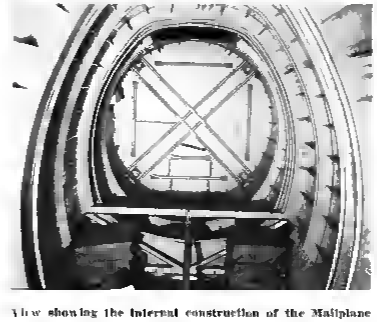
The three tri-engined transport planes exhibited fall into the range of more than 6,500 lb. and had passenger capacities ranging from fourteen to eighteen. Two were monoplanes and one a biplane.

OF THE FIFTY-FIVE AIRPLANES at the auditorium and the countless number at the airport at least four were rushed to completion by their manufacturers for the exposition. Two of these had not been completed in time for test flights while the remaining two had been flown.

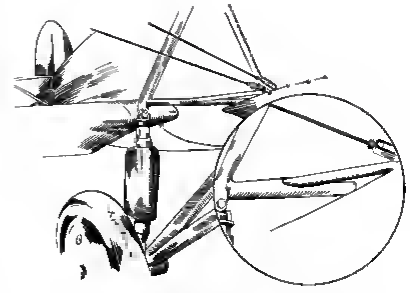
One of the most interesting and original designs at the exposition was the Model 107 Mail Transport Plane exhibited by the General Airplanes Corp. The general specifications for this plane were determined after a questionnaire had been sent by the General engineering staff to a large number of mail operators in an effort to obtain a concensus of opinion as to the requirements for this type of service.

The model 107 is a sesquiplane having a riveted aluminum alloy monocoupe fuselage of nearly elliptical transverse section and powered with a Pratt & Whitney Geared Hornet engine. It was the only airplane at the show powered with a geared engine. This airplane is designed for heavy load carrying, having a pay load of 2,000 lb. with a weight empty of 3,152 lb. and a normal gross weight of 6,250 lb. The wing span is 50 ft. and the overall length, 35 ft.

Spruce beams and aluminum alloy ribs with fabric covering are employed in the wing construction with



View showing the internal construction of the Mailplane



The skeleton showing the new type of landing gear installed on planes of the Waco Aircraft Corp.

the exception of the center section which has heat treated chrome molybdenum steel beams. An airfoil section having medium high lift qualities is employed in the wings which have tapered and washed out tips.

Unusually complete instrument equipment is provided and sliding rudder pedals with three possible adjustments for stature are furnished. The tail wheel is a non-steerable swivel type having a cam and spring to keep it in normal position and to limit its travel. Oleo shock absorber mechanism for the tail wheel is universally attached so that it does not turn with the wheel. The plane is fitted with cowling of the N A C A type having the oil tank built into the cowling to provide cooling. An exhaust collector ring is also provided and leads the exhaust through a tube streamlined into the lower portion of the fuselage and acting as both a heater for the interior and a silencer.

Another interesting airplane at the show was the Great Lakes 4A1 Amphibion powered with two of the latest model American Cirrus engines. This craft has been developed to meet the demand for a low powered amphibion of reasonable price which has long existed among private flyers.

The 4A1 amphibion is a four place biplane type, having engines mounted in streamlined nacelles between the wings which are of equal span and rectangular in plan form. The wing construction is similar to that of the Great Lakes training plane, consisting of wood spars, aluminum alloy ribs and fabric covering. The Gottingen 398 airfoil section however is used. Both structure and sheathing of the hull are of aluminum alloy and riveted. The hull is entered through a hatch directly above the rear seat and a portion of the seat back folds down to form a step while entering. A passage way between the recesses for the retracted landing wheels leads forward to the control compartments which contain two other seats. The shock absorbing mechanism on the landing gear is hydraulic while the retracting mechanism is operated by cables.

The tail group is well above the water line to avoid damage and is constructed of corrugated aluminum alloy. The craft has a wing span of 24 ft. 3 in. and a gross weight of 3,200 lb. The weight empty is 1,900 lb. Provision has been made to carry sixty gallons of fuel.

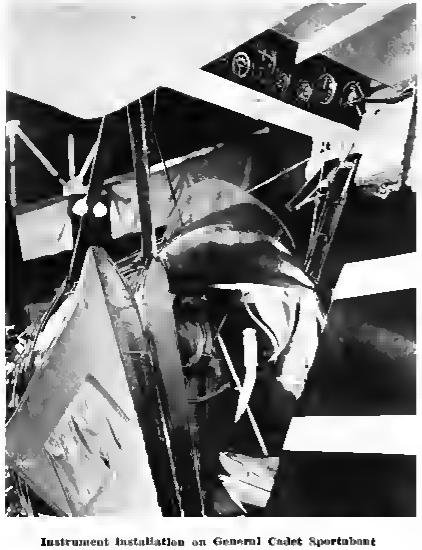
Representing the increasing class of low and center wing monoplanes, the Emsco Cirrus was another of the airplanes to make first appearances at the Cleveland exposition. This airplane is of the wire braced, center wing type and is intended for sport and training purposes.

It is powered with the American Cirrus engine, has a wing span of 36 ft, an overall length of 21 ft 10 in The weight empty is 1,090 lb and the gross weight, 1,640 lb

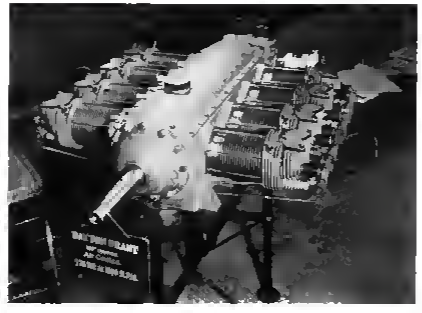
Conventional practice is followed in the construction of this plane which is the most recent product of the Emsco Aircraft Corporation The entire plane is well streamlined and an ample fairing at the junction of wings and fuselage provides space for two 15 gallon fuel tanks in the wing roots In a further attempt to reduce parasite drag, streamlined hoods are placed over the landing wheels The engine exhaust, which consists of a nickel steel manifold and tube, running to a point behind the rear cockpit, is suggestive of the types used on racing automobiles

Although not completed in time for the show, the new Travel Air low wing monoplane is noteworthy because of its excellent performance at the airport Two models of this highly interesting design were shown and flown at the airport by pilots Davis and Clark of the Travel Air Company These two models were identical in general design and construction, varying only in power plants and resultant streamline possibilities One of the planes was powered with the Wright New Whirlwind Nine engine in an N A C A cowling installation while the other was designed for the new Chevrolair engine, a six-cylinder inverted in-line air cooled type which like the airplane, made its first public appearance at the Cleveland Airport during the races

The new airplane is a single seat type, with no features contributing to high performance omitted The fuselage is of elliptical transverse section and is constructed of plywood on a welded steel tube structure The wing structure is of the conventional type and is also covered with plywood It is externally braced by streamlined struts The lower portion of the rudder carries a continuation of the fuselage lines streamlined to a point Fairings are provided for the landing wheels



Instrument installation on General Cadet Sportabout



The eight cylinder opposed "Grant" engine exhibited by the Dayton Airplane Engine Company

Another aircraft not new but publicly exhibited for the first time at the Cleveland auditorium was the McCarroll Duoplane, "Voyageur" This craft is a four place, twin engined, monoplane amphibion, powered with two New Whirlwind Five engines and designed also to meet the demand for a small amphibion It was exhibited by the Cadillac Aircraft Corporation

Engines are mounted in housings faired into the upper surfaces of the wing which, in the initial product, is constructed of wood and plywood with the exception of the center section which carries the engine mountings The single step hull is built of wood with riveted aluminum alloy sheathing A more extensive use of metal is planned by the designers, however, in future models Oleo shock absorbers are used on the landing gear, which is retractable by means of a drum and cable mechanism controlled by a crank in the cockpit The wing span is 48 ft and the overall length 33 ft, while the weight empty is 2,975 lb and the gross weight 4,100 lb

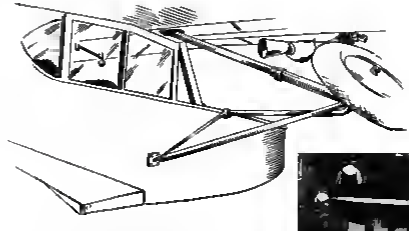
ONE CLEARLY DEFINED GROUP of airplanes at the show was that of new models developed from existing designs. This included the Curtiss Thrush, Boeing Model 80-A, the General Airplanes Cadet Sportabout, the Travel Air 10-B, the Golden Eagle Chief and others

The Thrush is a six place cabin monoplane bearing a marked resemblance to the Curtiss Robin, and also powered with the 170 hp. Curtiss Challenger engine This airplane is also available with the Wright New Whirlwind Seven engine and it was this model that was shown in the exhibit of Curtiss Flying Service. The Wright powered Thrush is an externally braced type, of conventional construction and furnished with complete instrument equipment It has a wing span of 48 ft, an overall length of 32 ft 6 in., a weight empty of 2,166 lb and a gross weight of 3,590 lb A fuel capacity of 110 gal is provided

While few fundamental changes have been made in its design and construction, the internal arrangement has been changed considerably in the Boeing Transport Plane, Model 80-A A passenger capacity of 18 persons is now provided The wing span has been increased to 85 ft, the length to 55 ft, while the weight empty is now 10,413 lb and the gross weight, 17,500 lb

In order to extend its line of models into the open

training plane field, the General Airplanes Corporation has developed the Cadet Sportabout, which is a modification of the Aristocrat This plane is a two place tandem monoplane of the externally braced type One of the features of this airplane is a rectangular cut-out in the center section of the wing, glazed on the upper surface with a transparent material to provide visibility above An instrument board is mounted in the space formed by the thickness of the center section in the forward side of this rectangle This makes it possible for the instruments to be seen by both student and pilot A torque tube type of control makes it possible to operate the switch, mounted on the right of the instrument board, from both cockpits



Above—A sketch showing retracted landing gear of McCarroll Duoplane. Right—A general photograph showing installation of the two Whirlwind Five engines

Several modifications have been made in the Wright powered Travel Air 10-B cabin monoplane, which is somewhat similar to the 6,000-B model, but with accommodations for four instead of six persons The shape of the windshield has been changed in the 10-B to provide greater visibility The 6,000-B is now available with four seats and a couch instead of six seats as formerly

A number of refinements have been made in the design of the Golden Eagle "Chief" This is a development of the original Golden Eagle monoplane In the new model, a detachable control stick, N A C A cowling, and streamline wheel fairings have been added

One of the late arrivals at the show was the tri-engined cabin monoplane, exhibited by the Hise Aircraft Corporation This plane has accommodations for six persons and is powered with three Kinner K-5 engines It is constructed conventionally and has a wing span of 52 ft, an overall length of 30 ft, 10 in and a gross weight of 4,350 lb It was the only airplane at the show having an overhead control stick and it was stated by the designer that overhead controls of the wheel type were to be installed in forthcoming models

That airplanes are to be used increasingly by executives as offices is indicated by the fact that several craft equipped for this service were found at the exposition and at the airport Among these was the Lockheed "Executive," a five place, Wasp powered model of the same general type as the "Vega" and the "Air Express" This plane has a desk and space for a portable typewriter, as well as a reclining lounge, seats and a telescoping lavatory compartment

The semi-inclosed monoplane exhibited for the first time in Cleveland by the Moreland Aircraft Corporation also was provided with a desk and space for other office equipment An airplane designed especially to accommodate a dictaphone was displayed at the airport by the Fairchild Aviation Company

Another indication of the intention of the designers to adapt airplanes to use as offices was found in the commercial adaptation of the Vought Corsair A sliding windshield covering a large portion of the cockpit, in closed position, has been made part of the equipment of this plane so that papers can be handled in that cockpit.

Another adaptation of military design, more to sport than commercial use, was found in the exhibit of United Aircraft and Transport, Inc This was the Boeing Model 100, a high performance fighter now stripped of its military equipment and offered in the commercial market

In addition to the Model 100, the Boeing company showed the Model 40-B4, a relatively new design This plane, which is known as a mail transport plane, is designed for two distinctive types of service An open cockpit at the rear is provided for the pilot, while the closed portion forward can be used to accommodate either four passengers or an equivalent load of mail or express, A minor design feature of this plane that would be useful in other aircraft, is a ring welded to the tail structure to facilitate lifting the tail or fastening it to a dolly

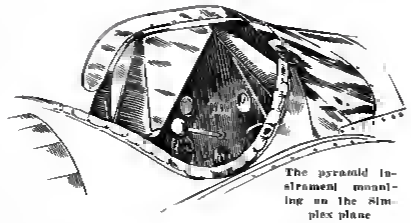
Two additions to the field of light training planes were the Inland Sport and the center wing monoplane exhibited by Samuel Taubman The Inland Sport is an open monoplane of the parasol type with seats in tandem It is powered with the Le Blond Sixty engine. The Taubman plane, which is not yet in production, is a two place, side by side seat type, having several novel features The fuselage is a Warren truss type of wood structure with plywood covering and the wing is of conventional wood and fabric design A portion of the fuselage covering is cut away where the wing panels are attached and it is possible, by the aid of transparent windows in the lower surface of the wing, to see the landing gear from the cockpit Future planes of this type will be built of metal, according to the designer The Le Blond Sixty is the standard power plant

IN ADDITION to the airplanes already mentioned, Kinner powered models of the American Eagle, Wallace Touroplane, Arrow Pursuit, Brunner Winkle Bird, Fleet, and Swallow TP were shown and the Kreutzer Air Coach with three Le Blond Nineties and the Aeromarine Klem low wing monoplane landplane, Arrow Sport, Davis V-3, Barling NB-3, with Le Blond Sixties The Curtiss Challenger powered Commandaire was shown by Curtiss Flying Service, Inc. Models powered with the five-cylinder Wright J-6 engine were exhibited by Alexander Aircraft Corporation, Fairchild, American Eagle and

Waco Aircraft Corporation and the new General Aristocrat powered with this engine was shown. Bellanca, Fokker, Ryan and Stearman planes powered with the nine-cylinder J-6 engine were displayed and Waco and Curtiss showed airplanes with the seven-cylinder J-6 engine. Pratt & Whitney engines were installed on the Boeing 80-A Boeing 100, Fairchild, Fokker, Ford, Hamilton and Vought planes.

The Hess Warrior engine was installed in the Alhance Argo plane and the Lambert engine was shown in the Star Cavalier.

Two seaplanes and one flying boat were exhibited, but were not new developments excepting the Aeromarine Klemm. The Bellanca CH300 Seaplane and the Eastman Flying boat already have been described. Two gliders were displayed by Heracio Alfaro of Cleveland.



The pyramid instrument mounting on the Simplex plane

THIRTY-ONE ENGINES were displayed at the Cleveland auditorium and it is significant that only one of this number, the Curtiss Conqueror, was of the water-cooled type. Of the remaining thirty air-cooled models, twenty-four were of the radial type, three were four-cylinder-in-line verticals, one was a converted rotary, one a six-cylinder-in-line inverted and one an eight-cylinder opposed type.

The two last mentioned were new designs that were exhibited for the first time at the show. As previously mentioned, both of these new designs have been created in an effort to facilitate streamlining in their installation and to increase visibility ahead which is so often lacking in airplanes powered with air cooled engines.

According to the announcement of the Curtiss Aeroplane and Motor Company, the inverted engine, designated "Crusader," will be available to manufacturers for original installations during the remainder of the year and the engine will be in regular production in 1930.

The engine develops 120 hp at 1,800 r.p.m., has a bore of 4½ in. and a stroke of 5½ in., giving a total piston displacement of 441 cu.in. The overall length is 4 ft 8¼ in. and the overall height 2 ft 8¼ in. The weight is 345 lb.

A photograph of the overhead cooled stick installed on the Kinner powered Hisc Trimotor

An air scoop, located on the exhaust side of the engine deflects air from the slipstream toward the cylinders. This device is proportioned in such a manner as to maintain the proper cylinder temperatures.

Each cylinder is made up of a forged steel sleeve machined all over and screwed and shrunk into an aluminum head. The head is designed with integral cooling fins and has one intake and one exhaust valve. Cylinders are attached to the crankcase by clamps instead of the numerous hold down studs.

A dry sump system of lubrication is used and, when the engine is in operation, the pistons are continually throwing oil upward into the crankcase. Pistons have two compression and three oil rings. An "underhead" cam shaft, which is similar in action to the general type of overhead cam shaft, now in use on automobile engines, is embodied in the design. Accessories include two Scintilla magnetos for dual ignition and a Stromberg carhureter.

The eight cylinder opposed engine exhibited by the Dayton Airplane Engine Company and known as the Dayton Grant, is rated at 225 hp. The two banks of four cylinders each are set at an angle of 180 deg.

Several unusual design features were found in the engine exhibited by General Airmotors Company. This power plant is a five-cylinder radial type having a rated output of 144 hp at 1,750 r.p.m. The weight of the engine is 365 lb.

The only geared engines at the show were Pratt & Whitney Wasp and Hornet of the Series C, which, together with the direct drive models of these engines, were displayed. These geared engines have been available for some time and probably will be used increasingly by airplane designers.

Table I—General Characteristics of a group of the airplanes exhibited at the Cleveland Show

Manufacturer	Designation	Type	Engine	No. of Seats	Construction: Wing	Construction: Fuselage or Hull	Dimensions (Ft.): Span	Dimensions (Ft.): Length	Dimensions (Ft.): Area	Weights (Lb.): Empty	Weights (Lb.): Gross	Weights (Lb.): Payload
Aeromarine Klemm	AKL 25	OLMl	40 Salmson	2	Wd	Wd	40 2	24 6"		815	1 325	
Alexander Bullet	AKL 40	OSMl	LeBlond 60	2	Wd	Wd	40 2	24 6				
Alliance Aircraft	32	CLMl	J-6-5	4	Wd F	Wl-St-F	30' 7	25 5	202			
American Eagle	Argo	OFL	Warner	2	Wd F	Wl St-F	28 8	20 2'		1 077	1 615	
American Eagle	Phaeton	OBl	J 6-5	3	Wd F	Wl St-F						
American Eagle	Kinner	OBl	Kinner	3	Wd F	Wl-St F	30	25 1	300	1 220	2,020	
American Eagle	Wallace Touroplane	CML	Kinner	5	Wd F	Wl-St-F	37'	24	212	1 200	2 000	425
Arrow	Pursuit	OBL	Kinner	2	Wd F	Wl-St-F	24 10	19 6	103	1 004	1 330	
Arrow	Sport	OBL	LeBlond 60	2	Wd F	Wl-St-F	24'10"	19'3	103	900	1 346	
Bellanca	CH300	CMS	J 6-9		Wd F	Wl St-F	46 4	30	273	2,033	4,033	
Boeing	80-A	CBL	5 Hornets	18	Duplane	Wl-St-F	95	53'	1 230	10 413	17,500	4,001
Boeing	40-E4	CBL	Wasp	5	Wd F	Wl-St-F	44 4"	33 4	545	5 889	8,079	1 170
Boeing	100	OBl	Wasp	1	Wd F	Wl St F	40'	26		1 082	2 753	60
Brenner Winkle	Ford	OBL	Kinner	3	Wd F	Wl-St-F	34	22'9	266	1 100	4 595	60
Cadillac Aircraft	McCarroll Duplane	CMA	2J-6-5	4	Wd-St-F	Wd D	48'	33'		2,975	4,100	60
Command-Aire		OBl	Challenger	3	Wd F	Wl-St-F	31 6	22'5	505	1,440	2 362	60
Curtiss	Thrush	CMl	J 6-7	6	Wd-D-F	Wl-St-F	48	32'6"	305	2,166	3,500	850
Curtiss	Kolm	CML	Challenger		Wd D-F	Wl St-F	41	25 1			2,293	850
Davis	A 5	OML	LeBlond	2	Wd-F	Wl-St-F	30'6"	19 8"		816	1,300	
Eastman	Flying Boat	CQBO	Challenger	3	Wd-F	D	36	26 3½	244	1,650	2,600	850
Ensign	Cirrus	OMeL	Cirrus	2	Wd-F	Wl-St-F	33	22		1,090	1,640	
Fairchild	71	CML	Wasp	7	Wd F	Wl-St-F	30	32 10'		3 040	5 500	
Fairchild	KR 34-A	OBl	J-6-5	3	Wd F	Wl St-F	30	23 3	285	1,455	2,400	850
Fleet	Model 2	OBL	Kinner	2	Wd-F	Wl-St-F	28	20 9		1 010	1 375	850
Fokker	F-10-A	CML	3 Wasps	14	Wd	Wl-St-F	71'3	51'0		21,020	35,190	
Fokker	Universal	CML	J-6-7	6	Wd	Wl-St-F	50 7'	36 2"		5 000	8 150	
Ford	4-AT-C	CML	3 Wasps	16	D	D	77'10	49 10		7,500	15 500	
General	Mailplane 107	CaQL	Geared Hornet	1	Wd D F	D	50	35	432, 4	3,152	6 230	2,000
General	Land 1 Sportaloni	OML	J 6-5	2	Wd F	Wl-St-F	36 8	26'7½	203, 7	1,500	1,942	188
General	Amusement	CML	J 6-5	3	Wd F	Wl-St-F	36' 4	25 4	195 4	1 266	2,110	410
Golden Eagle	Chief	OMl	LeBlond 90	2	Wd-F	Wl-St F	30'6	21 10'		940	1,450	
Great Lakes	4A1	CBA	2 Cirrus	4	Wd D F	D	74 3		302 5	1 900	3 200	410
Great Lakes	2 T 1	OBL	Cirrus	2	Wd D F	Wl-St-F	26 8	20 4"	197 6	907	1 580	410
Hamilton	H-47	CMl	Hornet	8	D	D	34 5'	54 8'	387	5 450	5,750	
Hisc Trimotor	Model A	CMl	3 Kinner	6	Wd F	Wl-St F	52'	36 10	378	2,625	4 350	1,725
Inland	Sport	OML	LeBlond 60	2	Wd-F	Wd-St F	30	19'4"		768	1 290	1 725
Interstate	S 5	CML	3 LeBlond 90	6	Wd-F	Wl-St-F	48'10		350	2,844	4 500	
Lockheed	Executive	CML	Wasp	5	Wd	Wd Mon	41			2,360	4 033	
Moreland		CMl	J 5	3	Wd	Wl-St-F	39'	28 6'	260	1 780	2 800	
Nichols Beasley	Sailing NB3	OMl	LeBlond 60	2	D F	Wl-St-F	32'9	21 11	159 3	744	1 373	
Ryan	Broughan	CML	J-6-9	6	Wd-F	Wl-St-F	42 4	28 4	268	2,200	4 000	
Star	Cavalier	CML	Velie M 5	2	Wd F	Wl-St-F	31 6	19 8	137	867	1 400	199
Stearman	C B3	OBL	J-6-9	3	Wd-F	Wl-St-F	35	24	297	2,150	2,850	
Swallow	TP	OFL	Kinner	2	Wd F	Wl-St-F	30'3			1,170	1 700	
Szekely	Flying Dutchman	OMlL	SR 3	1	Wd F	Wl-St F	26	18'		551 5	800	
Taulman		OMlL	LeBlond 60	2	Wd F	Wd	50	17 4	127	675	1 100	199
Travel Air	6000B	CML	J-6-9	6	Wd F	Wl-St-F	49 6½	31 2"	282	2,700	4,250	815
Travel Air	10B	CML	J-6-9	4	Wd F	Wl-St-F	43 6'	27 4½	239	2,255	3,400	510
Vaught	Corsair	OBL	Wasp	2	Wd-F	Wl-St-F	36					
Waco	165 Straight	OBL	J-6-5	3	Wd-F	Wl-St F	30 8	23	288	1 530	2,600	
Waco	225 Taper	OBL	J-6-7	5	Wd F	Wl-St-F	30 3	22'6	227	1,707	2,600	
Waco	225 Straight	OBL	J 6-7	3	Wd F	Wl-St-F	30 8'	23	288	1,550	2,600	
Whitbeesey	Avian	OBL	Cirrus	2	Wd-F	Wl-St-F	28	24'		875	1,600	

Type
O—Open
C—Closed
Cs—Semi Closed
L—Landplane
S—Seaplane
A—Amphibion
M—Monoplane
Wl—Low Wing
Mc—Center Wing
B—Biplane
Q—Sesquiplane

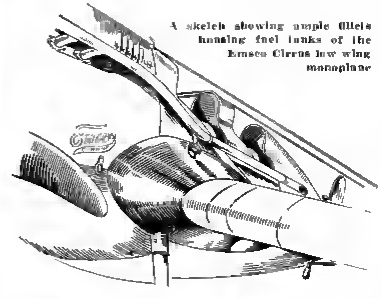
Construction
Wd—Wood
D—Aluminum alloy
St—Steel
F—Fabric
Wl—Welded
Mon—Monocoque

Engines
J 6-5—Whirlwind Five
J-6-7—Whirlwind Seven
J-6-9—Whirlwind Nine
SR 3—Szekely

In the Wright exhibit were found all three members of the J-6 New Whirlwind series as well as the Gipsy engine which is now being built by the Wright company.

One of the promised additions to the line of the Lycoming Manufacturing Company was exhibited, together with the initial product of the concern, which is now approved by the Department of Commerce. The rating given the nine cylinder engine is 185 hp at 2,000 r.p.m. and the total displacement 645 cu.in. The more recent seven cylinder engine is identical in construction to the older design and has a displacement of 500 cu.in. In both models the exhaust manifold is mounted between propeller and cylinders and is streamlined.

The series B engine developed by the Axelson Aircraft Engine Company was shown and a number of refinements have been embodied in the design. Changes have been made in crankcase, cylinders and valve mechanism. A three piece crankcase has been substituted for the four-piece type. The cylinder head has been redesigned and fins are now machined instead of being pressed on. Cylinder heads are screwed and shrunk to the barrels and the intake port has been moved to the rear. Compensating mechanism for the valves has been modified and streamlining of the rocker boxes improved.



A sketch showing ample fillets housing fuel tanks of the Ernest Cirrus low wing monoplane

Three engines, including the new "Sixty-six," were displayed by the Le Blond Aircraft Engine Corporation. The Sixty-six is similar to the "Sixty," excepting the bore which is ⅛ in. larger. The valve mechanism also has been modified. Although the engine was completed just in time for the show, it is expected that it will develop greater power and have a lower specific weight than the Le Blond Sixty.

The other engines exhibited are designs with which we are already familiar. These include the American Cirrus, Bliss Jupiter, Brownbach Comet, Curtiss Challenger, Dayton Bear, Kinner, Tips & Smith Super-Rhone, Szekely and Warrior.

Two superchargers displayed bear out the prediction that greater use is to be made of these devices. One of these was built on the Roots principle, while the other was of the turbo type.

The Roots type was shown by the American Cirrus Engine Company and has been designed for use with the engine produced by that concern. It was stated that engines equipped with these superchargers probably would be used on the twin engined amphibion exhibited by the Great Lakes Aircraft Corp.

Mechanism for the built in turbo type was exhibited by the General Electric Company. This device is in the

nature of a special installation and can be furnished for various engines

In general there are several design tendencies noticeable in radial engines. Accessories and push rods are located at the rear in the majority of engines, while the British practice of front exhaust or nose rings seems to be coming into more general use. The combination of two-piece crankshaft and one-piece master connecting rod seems to predominate and the cast aluminum head screwed and shrunk on a steel finned barrel is the most general type of cylinder construction. Rotary induction systems are being used even on the smaller types. Results of the standardization work of the S A E. are becoming more noticeable.

A larger proportion of exhibits than at previous shows was devoted to the broadening field of aeronautical accessories and it is regretted that more space could not be devoted to this important phase of the exposition. Engine and airplane accessories, communication equipment, airport and machine tool equipment, materials and general accessories were well represented at Cleveland.

A step in the direction of standardized cowling of the N A C A. type for radial engines as well as other types of cowlings and streamline forms has been made by the Hill Auto Body Company. This company has already made several special installations of hammered aluminum, in which welding has been skillfully employed, and a survey is being made of the requirements in this field with the intention of standardizing on several types.

Wood, micarta and metal propellers of various types were shown and a four bladed wood type was displayed by the Hartzell company. A controllable and reversible propeller was exhibited by Paragon Engineers, Inc.

An Eclipse hand starter for engines of approximately 100 hp. was shown and a combination inertia starter and booster magneto was displayed by the same company. One of the most recent Scintilla developments, a double vertical magneto that effects a considerable saving in weight, also was shown. The latest types of Stromberg carbureters and a complete line of wheels and brakes also were featured by the Bendix Aviation Corporation.

A new line of aircraft magnetos was displayed by the Robert Bosch Magneto Company, Inc.

The stage of the main auditorium was occupied largely by the Firestone, Goodyear and Goodrich tire companies and one of the most recent developments, the Goodyear "Air Wheel," a super balloon tire and its special mounting hub were featured in the exhibit of that concern. The "Air Wheel" was described in detail in a recent issue of AVIATION.

The efforts to obtain cleaner designs were reflected in the accessory exhibits by such devices as retractable and built-in landing lights. A built-in type was exhibited by the Fairchild Company, while retractable types were shown by the Allied Products Corporation and the Mechanical Research Laboratories.

Standardized airplane floats were shown by the Edo Aircraft Corporation. The new Heywood starter was exhibited by the Sky Specialties Corporation.

Radio and electric equipment was shown as planned by the Radiomarine Corporation, Western Electric Company and Leece-Neville Company and airport lighting equipment was displayed by General Electric, Westinghouse and Curtiss. An interesting flying instruction mechanism was displayed by Curtiss Flying Service. This device enables a student to practice flying a wind tunnel model airplane by operating controls in a full sized cockpit.

Hangar construction methods were shown by the Austin and Robertson companies and an interesting demonstration apparatus was utilized at the Robertson booth to show the efficiency of its ventilating system for hangars and factories. A useful device to open all types of hangar doors electrically was displayed by the Allen & Drew Company. Fueling pits and air compressors as well as other devices for airport machine shop equipment also were included in the exhibits.

The exhibit of the Air Reduction Company included a welding set especially designed for airplane construction work and the W-15 airplane welding set was shown in the booth of the Linde Air Products Company.

A note of humor was furnished by the exhibit of the Balsa Wood Company. Sledge hammers, anvils, dumb bells and other articles constructed of balsa wood were shown and many of the visitors were amazed by their lightness.

Several companies exhibited forgings and finished products made from their forgings. Among these was a concern new to the aeronautic field, the Canton Drop Forging and Machine Company.

The De Walt metal and wood cutters and the Bowlby Air Vice were exhibited in the booth of the De Walt Company. Complete servicing tool equipment for aeronautical work was displayed attractively by the Crescent Tool Company. Specially designed tools for aeronautical work were shown by the South Bend Lathe Company and the National Acme Company.

TABLE 2

	Cleveland Show	*Detroit Show*
Total planes entered	56	100
Monoplanes	33	48
Biplanes	21	47
Convertable	0	1
Sesquiplanes	2	4
Open planes	31	53
Closed planes	25	47
Land planes	51	95
Seaplanes, Flying Boats	3	3
Amphibions	2	2
Single engined	49	95
Twin engined	2	1
Three engined	5	4
One place	4	4
Two place	19	32
Three place	13	29
Four place	5	11
Five place	2	5
Six place	8	9
Seven place	0	2
Eight place	1	5
Twelve or more	3	3
Radial engined planes	51	90
Vertical in line air cooled	5	10
OX-5	0	9
O-50 hp.	1	3
50 150 hp	22	50
150 200 hp	11	14
200-300 hp	11	11
More than 300	11	27
Low wing	6	6
Center wing	2	3
Folding wing	4	7

Light Alloys IN AIRCRAFT

Discussion of Their Range and Usefulness Conducted by S.A.E. at Cleveland

By EDWARD P. WARNER

OF THE FIVE technical sessions jointly promoted by the Aeronautical Chamber of Commerce and the Society of Automotive Engineers during the race week, one was devoted to subjects primarily metallurgical. On Wednesday morning, four papers on topics in that field were presented before an audience containing a good representation both of specialists in materials and of airplane and engine designers. Mr. Carl B. Fritsche, of the Aircraft Development Corporation, whose metal-clad airship has been one of the most spectacular of recent employments of light alloy construction, presided.

The opening paper, and the most general of the group, was contributed by E. H. Dix, Jr., of the Aluminum Company of America. Mr. Dix summarized the present state of the aluminum alloys, indicating that copper was the commonest of alloying elements used with aluminum, with magnesium and manganese playing the most important secondary parts in rolling and forging alloys, and with silicon, nickel and iron extensively used in alloys intended for the foundry. When magnesium is the base of the alloy, on the other hand, it was indicated that aluminum is almost always present as one of the additional elements in quantities up to 12 per cent, manganese being second in importance in this group of materials. It was stated that whereas pure magnesium has a tensile strength of 25,000 lb. per sq.in. in the rolled condition, the addition of 4 per cent of aluminum and a very small amount of manganese raises this figure to 42,000 lb. and at the same time improves elongation.

The theory of heat treatment was discussed in some detail in the paper, but no attempt will be made to repeat that part of the subject matter here. It was explained that only those alloys which, like the Aluminum Company's No. 17S (duralumin) contain both copper and magnesium silicide can be heat-treated with hardening by natural ageing at room temperature. Others such as the Aluminum Company's No. 25S, much used for propeller blades and other forgings, require artificial ageing by reheating for about 12 hours to around 300 deg. F.

Among all the high-strength alloys tabulated by Mr. Dix, duralumin received the best rating on freedom from corrosion in the heat-treated condition. One other forging alloy, however, No. 51S, especially suited for difficult forgings, showed a better resistance to corrosion than duralumin when in the just-quenched state without having been artificially aged. Pure aluminum and Alclad were of course listed as distinctly superior to any of the alloys.

Some of the Specimens of Light Alloy Forgings and Castings Shown at the Meeting

Corrosion of Alloys

PROCEEDING FURTHER with the study of corrosion and classifying it as of several types, including the familiar pitting and the less familiar "intergranular" or "intercrystalline" phenomenon, the author called attention to the marked weakening of corrosion resistance resulting from artificial ageing of certain of the high strength alloys. For that reason he recommended against the use of the artificially aged alloys in the thin sheet form in aircraft construction. He pointed out that it has been shown by H. C. Knerr that the susceptibility of duralumin to intercrystalline corrosion is much affected by

the rate of quenching the material Quenching in hot water after heat treating has been found peculiarly objectionable on that ground the author stated and cold water should be used for quenching Hot water has often been employed to remove from the surface of the sheets the sodium nitrate from the heat treating bath, but Mr Dix advised that the material should first be quenched and then rinsed in hot water to clean the surface This point was taken up again in the discussion in response to a question by Lessiter C Milburn chief engineer of the Glenn L Martin Company and Mr Dix emphasized that for nitrate to remain on the surface of the sheet was very objectionable and increased the danger of surface corrosion He expressed himself as feeling little doubt however that heat treatment in the electric furnace would be the ultimate solution thus eliminating immersion in a sodium nitrate bath entirely

Mr Dix spoke briefly of the properties of Alclad, which he had already treated in an article in AVIATION (Dec 22 1928) and especially of the curious electrolytic action which protects the duralumin core from corrosion even after the pure aluminum surface coating has been removed from a substantial area It was reported that this action had been found adequate for the protection of spots of bare duralumin as large as one inch in diameter It was pointed out that this is especially important in protecting duralumin rivets used in assembling Alclad sheets The author reminded the readers of his paper that the protective electrolytic action of the aluminum coating is exactly the opposite of the detrimental action which would result from a nickel or copper coating Any abrasion in the surface of nickel-plated aluminum, for example, would cause rapid corrosion of the underlying material

Speaking of other means of protecting aluminum alloys Mr Dix emphasized the importance of a thorough cleaning of the surface by mild chemical agents before applying any protective coating He gave very limited approval to the anodic process of forming an oxide film on the surface for protection considering that 'the chief advantage of these oxide films lies in their use as a base for paints and varnishes' He found it advisable to give small aluminum alloy parts a priming coat of red iron oxide, or some similar material before assembling Mr Milburn in his discussion concurred even to the point of holding that this was vitally necessary The author suggested either aluminum or bituminous paint for a surface finish over the priming coat

A paper dealing with a sufficiently similar subject to be judged as a companion to Mr Dix's was given by G D Welty also of the Aluminum Company of America and was entitled 'Light Alloys in Engine Design'

Introducing the subject by pointing out that light alloys make up about one-half of the total weight of a modern aircraft engine Mr Welty stressed the great importance of selecting the correct alloy for each purpose and proceeded to enumerate a number and list the special functions for which they were best suited Of the high-strength forging alloys he mentioned three the familiar duralumin or 17S, 25S, and 51S Duralumin was recommended primarily for use in the sheet form, the other two for forgings No 25S, which when heat treated with artificial ageing has approximately the same strength, yield-point and elongation as duralumin, is especially suited for strong forgings, such as propeller blades and engine parts of relatively simple form and requiring great strength It may also be used for bearings on journals which are case hardened or otherwise given a sufficient hardness for the purpose Bearings may thus be formed directly in connecting rods forged of this alloy The third forging alloy mentioned by the author 51S has a strength and yield-point somewhat lower than the others in the group, but has the advantage of being easy to work in difficult forgings It was therefore especially recommended for such parts as forged crankcases for radial engines

Alloys for Engine Castings

Of the casting alloys the long famous No 12 was first mentioned With a yield point of about 10,000 lb per sq in, or about one-fourth that of the best forging alloys and with an elongation of only 2 per cent the author recommended it only for use in small engines No 195, a comparatively new casting alloy subject to heat treating, was listed with a tensile strength of better than 30,000 lb per sq in a yield point of 13,500, and an elongation of from 6 to 12 per cent before rupture Mr Welty told his audience that a $\frac{1}{2}$-in sand-cast bar of this alloy could be bent through 90 deg in a vise without breakage a statement that would have been very startling to anyone whose experience with light alloy castings had been gained entirely from ordinary commercial foundry work in that material for non-aeronautical purposes The new alloy has the further advantage over No 12 of a density about three per cent lower

Although rolling into sheets, castings, and forgings covers the general range of operations to which the light alloys are commonly subjected Mr Welty went on to point out that there are certain special purposes for which specialized properties other than strength, such as thermal characteristics become of outstanding importance There is, for example the well known Y-alloy, much used in England and to a considerable extent in this country for castings and sometimes for forgings as well It is especially notable for its strength at high temperatures An American alloy for similar purposes is No 122, which has strength about equal to its rival just mentioned, but is a little heavier No 132 on the other hand, a comparatively new alloy is about 3 per cent lighter than the Y material and is remarkable for a coefficient of expansion so low that when used for making pistons it permits of the reduction of piston clearance by about 20 per cent of the usual values The material is difficult to work but can be handled with the most modern cutting materials and grinds well In respect to thermal conductivity the paper indicated that No 132, which contains 13 per cent of silicon is probably not inferior to Y and 122 This alloy is at present best fitted for use in pistons, as it is not suitable for sand castings The forms in which it is employed must therefore be simple enough to permit the use of a permanent mold

Mr Welty went on to the discussion of the magnesium alloys and predicted that they would be used extensively within a few years He commented very favorably on their strength as castings and upon their machinability and upon the freedom of the castings from flaws He felt, however that there should be further tests before general use in structural parts could be approved A defect of the magnesium-aluminum alloys for pistons and other parts adjacent to the combustion chamber of an engine is the thermal conductivity which is only about one-half that of Y alloy Mr Welty also indicated that the cost of the magnesium alloys must be expected to run appreciably perhaps from 25 to 60 per cent, above that of the aluminum-base materials In aircraft service, however, it is the consensus of opinion, as Mr Geisse's paper at the engine session at Cleveland helped to show, that it is profitable to pay even a very high price for any appreciable saving of weight In the long run, on grounds of economy alone, a pound of weight reduction is worth many dollars of first cost

The discussion of Mr Welty's paper was very brief In response to a question, the author agreed that permanent mold castings tend to replace sand castings wherever possible in the interests of efficiency and greater strength, as well as of economy when the production becomes very large He indicated that the designs of crankcases and other complex parts are in some cases in process of being modified to permit of more extensive use of permanent molds

Beryllium

Another of the papers offered at the session dealt with a light material of quite a different category C B Sawyer, of the Brush Laboratories, spoke on the properties and industrial potentialities of beryllium

Beryllium, he said, resembles magnesium and aluminum in certain of its chemical properties Its density is about that of magnesium, while the modulus of elasticity equals the value for steel and the strength is approximately that of a mild steel Its corrosion resistance is better than that of aluminum The one outstanding defect in physical properties to which the speaker called attention is the low ductility, but he pointed to the history of tungsten and of the art of drawing tungsten wire as an example offering a warning against too much pessimism on the score of beryllium's unsatisfactory ductile properties

Mr Sawyer made brief mention of beryllium alloys particularly of one of about 60 per cent of beryllium with aluminum, which has good ductility and a tensile strength of about 80,000 lb per sq in

On the subject of production cost of beryllium, the author of the paper appeared not at all pessimistic He indicated that the element was by no means a rare one and that the cost of the ore now used for extracting the metal might be expected, under quantity production conditions, to be only about 50 cents per pound of beryllium yielded

Upon this basis he estimated the total cost of production might reasonably be reduced to something between $1 50 and $2 80 per pound In this connection, and also in optimistic vein, the chairman reminded the audience that at the centennial exhibition in 1876 a small block of aluminum had been displayed under a glass case and under police guard, with a value of $170 per pound placed upon it

The announced plan had been to have a discussion on beryllium resolving itself into a symposium, but it failed to materialize, no one coming forward to add anything to Mr Sawyer's opening remarks

Precautions for Welding

The final paper of the session, although still metallurgical, broke away from the light alloys Mr Richard M Mock, at one time technical editor of AVIATION and now engineer with the Ballanca Corporation, spoke on "Welding in Aircraft Construction" He concerned himself almost exclusively with the welding of steel, and especially of tubular structures, making only passing mention of the possibilities of welding aluminum and its alloys

Mr Mock gave special weight to the responsibility of the designer for a successful weld and to the necessity of choosing gages and forms which give the shop a feasible job to work upon He especially urged the avoidance of edge welds, and the making of welds away from heavy members and toward lighter ones and from one side only of the very thinnest materials He spoke also of the necessity of so designing the structure that internal stresses in cooling will not be high, especially in the thinnest-walled members, where they are likely to cause cracking An example of a particular change of internal condition, although one not due to expansion and contration, was given in citing the danger of welding a circle completely around a tube in a single plane If that be done, the tube is definitely weakened at one section close to the weld where annealing has taken place By always using a scarfed or fish-mouth weld, Mr Mock suggested, the annealing action could be distributed and its harmful effects reduced Since there is some weakening by annealing in any case at some part of the tube, Mr Mock advised allowing for it in making a stress analysis His own practice has been to employ a coefficient of fixity of never more than two when using a tubular member in compression and fixed by welding at its ends

Recognizing that it is not always possible to eliminate all theoretically undesirable features of the design, and that the shop may have imposed on it the making of peculiarly difficult welds, Mr Mock cited the case of the welding of a steel lug one-half inch thick to a 0 49 in sheet For that job he used two welders with two torches, one keeping the heavier member preheated while the other joined the two together Uneven heating and uneven cooling are the bane of welding operations

The author dealt especially with welded tubular structures He mentioned the frequent use of fittings built up by welding steel plates together, but indicated a steadily increasing tendency toward light-alloy castings or forgings for this purpose On the other hand, welding is coming into extended use in control surfaces and wing spars

The author inclined toward the recommendation of low carbon steel welding rods wherever they could be used without loss of strength He indicated that welding was more difficult with an alloy steel rod, and that the welds were less likely to be homogeneous in strength although there is a tendency toward the use of alloy steel in assembling a structure that is to be heat-treated after welding No definite conclusions were expressed upon the relative advantages of gas and electric welding

After description of the welding process used in the Bellanca plane, Mr Mock went on to describe the training of men for the work His company has found it best to start with labor with no welding experience and teach it from the ground up After a few weeks of pure instruction in welding up scrap, the apprentice is allowed to go on to tack welding of minor members under supervision After a total of about eight months of preliminary experience he is considered available for most welding work, and approximately a year rates him as fully qualified It is the practice, however, to test the work of each man at intervals to encourage continued care

Upon this paper there was no discussion, and the meeting concluded with the showing of moving pictures of the construction and test flights of the Aircraft Development Corporation's metal-clad airship, and with remarks by Ralph H Upson, designer of the ship, and Capt William F Kepner of the Army Air Corps, its commander during the test flights

THE *Airplane Design* OF THE *S. A. E.*

THE SOCIETY of Automotive Engineers meeting with the Aeronautical Chamber of Commerce joining in sponsorship to discuss the theoretical problems of airplane design was held Tuesday morning as a part of the general aeronautical meeting of the Society. The entire time was devoted to the consideration of two lengthy and far reaching papers: "Wings—A Co-ordinated System of Basic Design," by Ralph H. Upson, and "Criteria for the Structural Strength of Airplanes," by Professor Alfred S. Niles, formerly of the structural branch at Cook Field and now Professor of Aeronautics Engineering at Stanford University. Mr. C. H. Chatfield, lately of the aeronautical engineering faculty at the Massachusetts Institute of Technology and now with the Pratt & Whitney Aircraft Company, presided.

Mr. Upson's paper, which covered some thirty-five mimeographed pages and was strongly mathematical in spots, does not lend itself as a whole to easy abbreviated review. Readers interested in the detail of the author's procedure can only be referred to the original paper. It is, however, possible to summarize the objects, the general methods employed and the important conclusions.

Mr. Upson's research was of a type that is often discussed by aeronautical engineers but that has never, so far as the present writer is aware, been carried out with such thoroughness. It was his undertaking to secure the most general expressions possible for the weight of an airplane structure and for its total aerodynamic resistance, leaving all of the most important dimensions of the machine of the airplane in the equations as variables, and then by comparison to determine in general terms the most efficient wing section, plan form of wing, aspect ratio, etc., taking both weight and drag into account.

It has become common practice among those familiar with the merest rudiments of wing theory to divide the drag of an airplane into three parts, induced, wing profile, and parasite. Evidence of the thoroughness of Mr. Upson's procedure is furnished by his having further subdivided the three groupings into seven. Induced drag he left as usual under a single heading, since it is already fully covered by a mathematical formula, although he later made special comment on what he called "induced interference." Parasite resistance was split into three parts, the permanent and unchangeable portion originating elsewhere than in the wing structure, the contribution of the interplane bracing or other external wing bracing, and a variable portion due to such factors as the change of resistance of the fuselage with changing angle of attack. Profile drag was also divided into three parts, the basic amount due to skin friction, the added amount due to the thickness of the airfoil section and

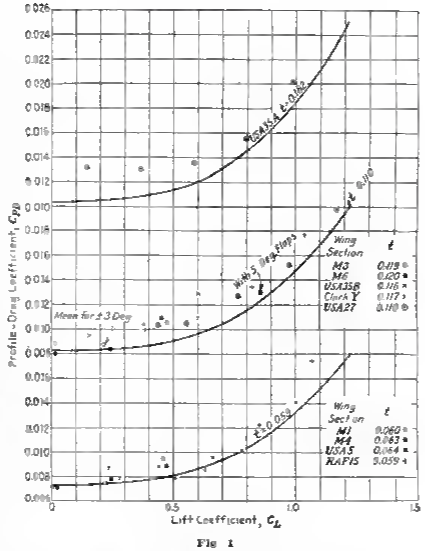


Fig. 1

the resultant increase in disturbance of the flow past it, and the additional profile drag due to the lift coefficient. Mr. Upson has found that the profile drag coefficient for good wing sections at zero lift exceeds the skin friction by an amount substantially proportional to the square of the thickness of the airfoil section (of course stated in terms of a fraction of the chord), and as the lift coefficient is increased the profile drag coefficient also increases by an amount in direct proportion to the cube of the lift. Curves bearing on the latter point, taken from Mr. Upson's paper, are presented as Fig. 1.

Weight was also divided into seven parts, one of them being the fixed load, including the useful load, powerplant, and all parts of the structure not directly affected by the proportions of the wings. The other six were respectively the weights of the flanges of the wing spars, the webs of the spars, the structure of the ribs, the internal drag bracing, the external wing bracing and the covering or skin.

SESSION

By EDWARD P. WARNER

In making his analysis the author, having been concerned with the manufacture of the Aeromarine Klemm at the time of preparing the paper, took that machine as a basic example. It will be recalled that it is a low-wing monoplane with cantilever wings covered with plywood. The span is 40 ft., the wing area 196 sq. ft., giving an aspect ratio for the tapered wing of almost exactly eight. The gross weight is 1325 lb.

Space limitations prohibit the reproduction of Mr. Upson's arguments in full, but a few striking figures may be drawn from their contents. Of the weight of 1325 lb., it was estimated that 1000 lb. represents the fixed load, the remainder coming from the variable portion of the wings. Of the 325 lb. remaining, the wing covering, which is entirely of plywood, contributes almost exactly one-half. One-quarter of the total comes from the wing spar flanges, and one-eighth each from the ribs and the spar web members. There is of course no external bracing and the drag bracing is replaced by the rigid skin.

The break-up of weight is of course independent of flight conditions, but that of drag depends upon the lift coefficient, and Mr. Upson made the drag analysis for several different speeds. At 100 m.p.h., the approximate maximum speed of the airplane, the fixed portion of parasite resistance contributes 125 lb. out of the total of 200. The skin friction was 43 lb., and the additional profile drag due to thickness of the section, in spite of the unusual thickness necessary for the cantilever structure, was only sixteen. The induced drag at that speed was 15 lb.

At 60 m.p.h., near the speed of best climb, the distribution changes very materially. The total drag has dropped to 113 lb., and 42 lb. or more than one-third, comes from the induced drag, which contributes less than ten per cent of the total at the highest speed. Fixed parasite drag still remains the largest item, however, with 45 lb., while skin friction, varying approximately in proportion to the square of the speed, has gone down to sixteen. The additional profile drag due to lift coefficient has begun to have some significance at 60 m.p.h., adding 5 lb. to the total.

Wing Forms and Performance

ALL THIS was preliminary to Mr. Upson's real object, of finding the total effect of changes in the design. His first step was to assume a constant area and aspect ratio and investigate the effect of changing the amount of taper of the wings in plan form. There are of course various structural assumptions which might be attached to a change of taper. In this paper the author elected

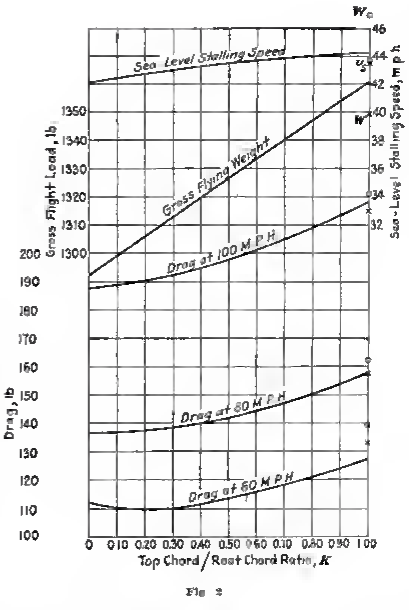


Fig. 2

to keep the same weight and dimensions of spar flanges throughout. Increasing the amount of taper, since it increased the chord of the wing at the root, therefore made it possible to reduce the relative thickness of the section.

The only important change in weight as the taper was changed on these assumptions, which seem very reasonable ones, came from the ribs and the spar webs. In both cases there was a marked saving with increasing taper, largely because of the relatively thinner sections used. It was found, for example, that the webs would weigh 55 lb. in a rectangular wing, while tapering to a tip chord only half that at the root was found to reduce the weight to 38 lb. and further tapering to a tip chord one-quarter of the maximum at the fuselage brought a further reduction of the figure to 30. The corresponding figures for the weight of the ribs were 58, 40 and 32, and for the total weight of the airplane 1361, 1326 and 1310.

Variations in drag were more important. With a rectangular wing the total drag calculated for the airplane was 218 lb. at 100 m.p.h. and 127 at 60 m.p.h., figures which were reduced to 198 and 114 by tapering to a tip chord one-half that at the root and to 192 and 109 by further tapering to 25 per cent. Ninety per cent of this saving at the high speed, and about one-half at the lower velocity, resulted from the reduction of the profile drag as the result of the use of thinner wing sections with the more tapered plan forms. Practically all of the remainder appeared in the induced drag items, since a taper to a tip-chord of a little less than a half that at the root gives the closest approximation to the theoretically ideal distribution of lift along the span.

Mr Upson's curves of total drag at various speeds and of weight are plotted against the amount of taper in Fig 2

A similar investigation was made on the effect of changing span while keeping a constant area. Increasing span of course increases profile drag slightly, since thicker sections must be used, and increases the structural weight considerably, but makes a great saving in induced drag, especially at cruising speeds. The general results as obtained by Mr Upson are reproduced in Fig 3, where it will be noted that the drag remains almost constant at high speeds, since the induced portion is there relatively unimportant but varies sharply with span at 60 m p h

Results of a similar investigation on the effect of changing area, while keeping a constant span (the aspect ratio therefore being increased with decreasing area)

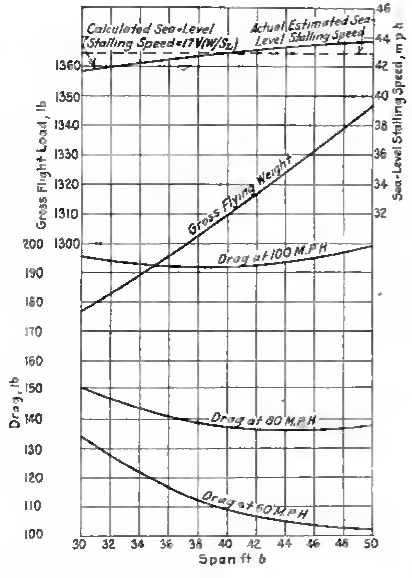


Fig 3

are displayed in Fig 4, drawn like all the others from the original paper It again proves that the variations in weight are relatively more important than those in drag

For the study of the effect of changing thickness as for the two cases immediately preceding, Mr Upson gave no detailed figures for drag and weight by separate items Again, therefore, the data are presented simply in graphical form in Fig 5 It was a little surprising at first sight to be told that an increase of wing thickness beyond fifteen per cent of the chord would yield no further saving of weight in a taper-wing straight cantilever monoplane

In other words, beyond that point the weight of ribs and spar webs was found to increase more rapidly than the weight of the flanges could be diminished

External Bracing vs Cantilever Wings

THE EFFECT of introducing external wing bracing was investigated by direct comparison of the efficiency of a rectangular cantilever wing and that of the same wing with two different sets of wing bracing In the first externally braced case the only added members were struts running directly from the top longerons to a point of attachment half way out on the upper surfaces of the wings (since the machine was of the low-wing type) The second alternative was to provide these struts with intermediate bracing by light reinforcing members attached at their middle points and connecting to the wing The external bracing made it possible to reduce the wing thickness from 23 per cent to 8 8 per cent of the chord The effects as tabulated by Mr Upson were surprisingly small, neither the drag nor the gross weight of the plane being changed by more than 2 per cent In general, the external bracing without intermediate reinforcements showed itself slightly worse than the rectangular cantilever arrangement, whereas that with the intermediate bracing for the struts was slightly better Both were distinctly inferior to the tapered cantilever wings Better results might have been obtained, however, if the externally braced wing had been made a little thicker and given lighter spar flanges instead of being reduced in thickness in direct proportion to the reduction of bending moment and having the flanges kept the same in weight

In the paper as printed, Mr Upson went on to emphasize the importance of interference between the fuselage and the wing and especially of what he called, in accordance with a suggestion by Mr J D North the induced interference The effect of a fuselage of bad aerodynamic form in changing the effective working aspect ratio of a wing, especially on a low-wing monoplane, may nearly double the induced drag calculated by ordinary formulas Data from a test of a Junkers machine was cited in support of this statement Figures taken from National Advisory Committee tests of a Sperry Messenger similarly show that for a biplane the direct or non-induced interference between the wings and other parts of the structure may add as much as 60 per cent to the parasite drag of the fuselage and landing gear tested alone The author closed the written paper with the general conclusions among others, "A set of internally braced wings of ideal proportions has from 20 to 30 per cent less drag exclusive of that due to the fuselage, and slightly less weight than the best arrangement of rectangular wings either internally or externally braced except in a case where bracing with wire alone is possible Considering also the improved stability and control afforded by tapered wings, the importance of devising economical production methods for such airplanes is apparent . . . Adequate span is the prime essential for any design with a large power loading Many small airplanes have been failures mainly from this cause." In abstracting the paper verbally, however, Mr Upson went on to give some additional data not included in the printed copy, supplementing his discussion of his own work with a vigorous plea for the more general use of mathematical methods in airfoil section design and selection He presented a curve of maximum lift against mean camber of airfoil section which is approximately reproduced in Fig 6 Individual sections of course vary in their properties but in general, for

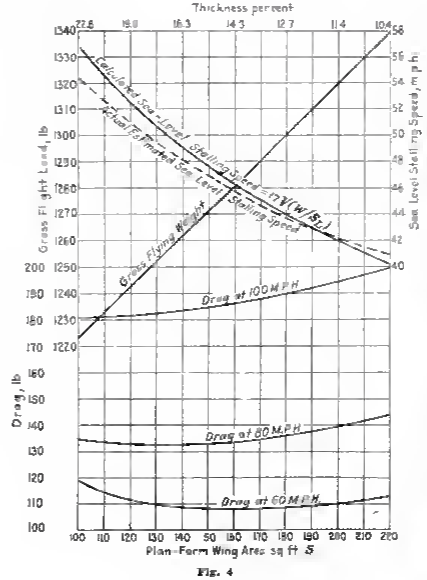


Fig 4

smooth and well-designed forms, the maximum lift is a function of the mean camber

Certain conclusions were drawn about the wing section which should be selected on the assumption that the ratio

$$\frac{\text{aspect ratio}}{\text{thickness ratio}}$$

remains constant, presuming that the span of a wing of constant chord could be doubled without sacrifice of efficiency if the thickness were also doubled This may be questioned, as the bending moment in a spar varies in proportion to the square of the span and the strength in bending for a given spar weight varies only as the first power of the thickness Taking the assumptions as stated, however, Mr Upson concluded that for a span of fifty times the thickness of the wing a maximum lift-drag ratio of 25 would be obtained by using a thickness of twenty per cent of the chord, with an aspect ratio of ten.

Shortage of time prevented any extended discussion of Mr Upson's paper, and the meeting turned at once to the consideration of Professor Niles' work on load factors and load distribution. Since the author was unable to attend the meeting, his paper was presented in abstract by the writer of this review

Stress Analysis and Load Factors

THE PAPER concerned itself especially with the present rules of the Department of Commerce for loading and stress analysis of airplanes and the possible desirability of modifying them in various respects, and the discussion was divided into more or less distinct parts

The author disposed rather summarily of the possibility of a general revision in stress analysis procedure which would provide for the design of structures to have the maximum stress in any member under the most severe anticipated working conditions not in excess of a definite fraction of the yield-point for the material, instead of following the present standard practice of designing to carry approximately one and a half to two times the maximum anticipated load before there is actual collapse of the structure The factor of 1 5 or 2 is, of course, the true factor of safety to allow for deterioration of the structure, or for imperfections of material or workmanship There has been feeling among many students of structural theory, especially in England, that to base analysis on working stresses below the yield-point would be more logical than the present method, but Professor Niles expressed the view that a quite sufficient objection to the change would be the impossibility of checking the stress analysis by a static test to destruction Only if the analysis is based on the actual failing load of the structure will a static test be useful for check

A less academic question, and one to which the author devoted much attention, is the possible desirability of modifying the load factors now specified for commercial airplanes Professor Niles tabulated the results of all the accelerometer tests that have been made in recent years at McCook and Langley Fields, and placed beside them the load factors for which the rules would now require that the various planes used in the tests should be designed On the PW-9, for example, load factors running up to 7 3 have actually been experienced in flight (figures even considerably higher than that have been attained in more recent tests at Langley Field), while the Department of Commerce rules would require designing such a machine for a factor of 7 7, leaving a margin of safety of only five per cent In ten of the

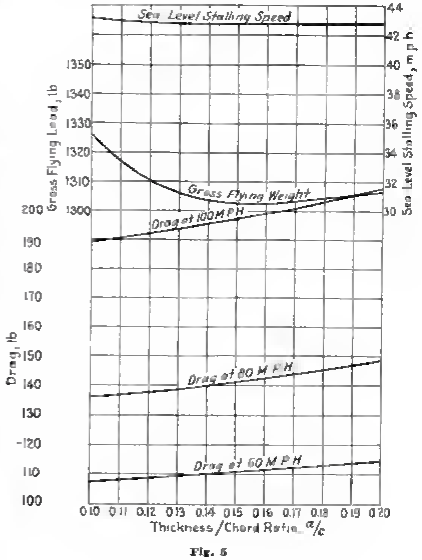


Fig 5

eighteen airplanes tabulated by Professor Niles as having been the subject of accelerometer tests the margin of safety was less than the 50 per cent which ought to be considered as the minimum. The machines which proved to be safe were in most cases of large size and relatively slow. For pursuit planes, the present factors appeared uniformly too low.

Analyzing these data at some length, with incidental reference to the probable magnitudes of loads experienced in bumpy air and to our lack of adequate information on that subject, Professor Niles concluded that the present practice of classifying planes by weight and power loading was as reasonable as any that could be adopted unless a classification in terms of type of service could be arrived at, a process of admitted difficulty, and that "The load factors called for by the Department of Commerce are sufficiently high but not too high for heavy and lightly powered designs, the load factors for the lighter and more heavily powered designs should be raised so that the severe maneuvers to which these types are subjected, particularly in training work, will not cause excessive stresses." The paper especially commended the present practice of calling for twenty per cent more strength in terminals and joints and fittings in general than is required in the major structural members.

The second general topic treated was that of load distribution on the structure. Professor Niles felt that

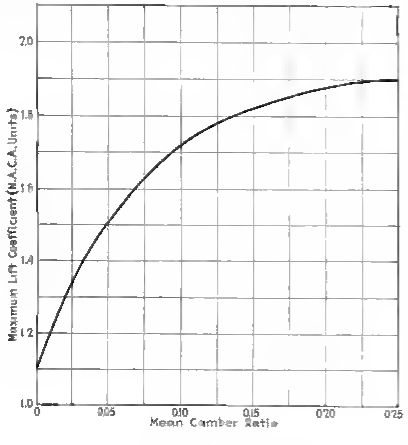


Fig. 8

the scarcity of data on pressure distribution prevented any confident recommendation of changes in loading at the present time. He did, however, suggest that the maximum intensity of loading on the wing tip is probably too small at present, and that the bending moment at the outer strut point in biplanes ought to be further increased although it is at present hardly possible to give any accurate general rules for the correction to be made.

One loading condition of which the immediate revision was strongly urged was that covering the vertical dive. Professor Niles pointed out that he had had a hand in the original preparation of the present specification on that point, and that it had been planned for tentative and temporary use. It is especially defective, he said, in that it makes insufficient allowance for differences between the various airfoil sections that are used, some of them imposing much more twisting moment in the wing truss than others during a dive. He urged that it be fundamentally remodeled.

Designers frequently complain that the Department of Commerce regulations on stressing are too involved and require the examination of too many load conditions. The author expressed but little sympathy with the first complaint, much more with the second. He believed that some combining of loadings to reduce the total number of conditions calling for separate treatment should be possible, especially in the fuselage and landing gear, but recommended that any change of the sort be made only after long and careful deliberation and study of the effect on specific cases.

Static Testing

THE LAST GENERAL POINT considered bore upon the desirability of static testing of commercial airplanes. On this subject Professor Niles expressed no revolutionary conclusions. He suggested that for some parts, of which plywood ribs furnish a good example, static tests are much easier and cheaper to make than reliable stress analyses, and should accordingly be directly depended upon. Other structural elements, of which welded steel tube fuselages were given as an instance, have been found by experience to be subject to such reliable and accurate stress analyses that static tests are quite unnecessary. In any case, the author suggested that static tests need be employed only for a restricted number of loading conditions, the results being extended to cover other cases by mathematical analyses. Although he was not disposed to urge going to extremes in static testing, he did feel that a load to destruction should be used as a general check on any design about to go into quantity production, for "Errors can always creep into a stress analysis, and omissions may be made."

Professor Niles urged that more careful attention be given to stressing in general, using phrases scathing in their very moderation. "The writer," he said, "does not regard it a hardship on the constructor to ask for either a static test or a stress analysis of every main structural part of an airplane. The designer should have such data for his own information before offering his design to the public. Entirely too great a tendency exists to design either by pure guess work, euphemistically styled 'practical experience' or by blind copying, in which calipers take the place of the slide rule, without checking the results by any adequate method. In the end each design should be backed by tests made either on the design in question or on similar designs."

Limitations of time again checked discussion. The only extended remarks were made by the present writer, who urged that it was quite impractical, as shown by all accelerometer tests made to design an airplane which would be incapable of being broken in the air by a heavy-handed pilot, and that it should therefore be frankly recognized that a certain degree of discretion would be observed by the pilot and that certain limitations would be put on his use of the machine. He suggested that if adequate notice were posted on the instrument board that the plane must not be dived to beyond a certain speed, the designer would be justified in assuming that those instructions would be at least approximately followed, and in choosing his load factors accordingly.

THE AERONAUTICAL CHAMBER

Talks of Many Things

Department of Commerce Regulations, Standard Fuels, Uniform Discounts, and Production Reports Among Subjects Discussed at Cleveland

By Edward P. Warner

THE MEMBERSHIP of the Aeronautical Chamber of Commerce came to Cleveland with so much business to be done that they followed the practice, established on several other recent occasions of meeting always in sections and never as a whole.

Since the most crowded program was that for the airplane manufacturers alone or in combination with other groups, they got away to an early start on Monday morning under the chairmanship of J. Don Alexander, president of the company bearing his name. The Commercial Aircraft Manufacturers' Section, according to a list corrected to August 7, numbers 63 members. Only about twenty-five individual representatives of the industry, however, attended the opening meeting, where the program included topics of far-reaching importance to the whole industry.

The Production Report

AN OPENING FORMALITY was the presentation by Charles E. Parker, of the Chamber's Staff, of the report of airplane production for the first six months of the present year. A substantial part of the report is printed elsewhere in the current issue. Its most striking features, apart from the over-all total of 2,854 commercial and 527 military airplanes produced during the six months by firms furnishing reports to the Chamber, were the virtual disappearance of the cabin biplane, the enormous growth in production of cabin monoplanes in general and multi-engine monoplanes in particular, and the increasing popularity of flying boats and amphibions. Of the total estimated production of 3,500 planes, approximately 90 per cent came from the plants of members of the Aeronautical Chamber.

The production of open-cockpit biplanes for the first six months of 1929 was approximately two-thirds of that for the whole of 1928. The number of cabin monoplanes built however, exceeded the figure for the entire previous year, and the number of multi-engined machines was almost double the 1928 total, as were the production both of flying boats and of amphibions.

The report showed prices remaining relatively steady, with a slight upward tendency. Roughly speaking (the report contained no basis for an exact calculation for individual types) the retail value of the open biplanes without engines averaged $3,000 during last year and $3,300 for the first half of the present year, while the corresponding figures for cabin monoplanes were about $6,800 and $7,200. The flying boats and amphibions, all lumped in together, increased their average from $22,300 to $25,100. The aggregate commercial production for the six-month period was $17,032,747, not including engines, and the military construction contributed $6,652,825 more. The inclusion of the engine figures, later given in a separate report, showed that the industry's production during the first half of 1929 was almost exactly 75 per cent commercial.

The report on engine production was not released until Tuesday morning, when it was laid before a meeting of the engine manufacturers, but it is best to report it immediately beside the airplane figures. The production of commercial engines reported by fifteen different manufacturers totaled 3,275, or about 15 per cent in excess of the airplane figure. Allowing for the number of multi-engine machines built, however, the actual excess of engines was reduced to about 4 per cent. For the previous year the number of commercial engines built had been almost exactly one-half of the number used in new airplanes. The influence of the war-time engine over that period, and its extraordinarily rapid decline in the last six months, stands out from these figures too clearly to need discussion. More evidence bearing on the same point is furnished by the break-down of engine production into classes by power output. In 1928 the reported production of engines of less than 200 hp was almost trivial, totaling only 450 units. For the first six months of 1929, with the OX-5 definitely in the

background, the corresponding total has jumped to 1 550 Production in the 200-300-hp class fell off considerably, but it is easy to infer that this was due to the cessation of production of the Wright J-5 during the early months of the present year, that power plant having been the main stay of the 200-hp division during 1928 Another striking point, symbolizing the increasing vogue of the "luxury ship" with high power and lots of speed, was the increase from 475 to 1 242 of the number of commercial engines of over 300 hp

The total retail value of the engines built in the period covered by the report was $10 900 000 approximately, as against $8 937 000 for 1928 Military production increased the aggregate business done by the engine industries to something over $14 000 000 in six months

Retail prices for last year and this year cannot be compared as no detailed break-down of the value of output was made for 1928 For the more recent period however, separate totals were compiled and show a remarkably close adherence all the way along the power scale from 50 hp up to 400, to an average retail price of $13 00 per horsepower Leaving out of consideration the engines of less than 50 hp, on which the average would be expected to run higher, one group rose to $17 00 per horsepower, but all the rest hung very close to the $13 00 mean These averages, again, are unofficial deductions by the writer from the data contained in the report

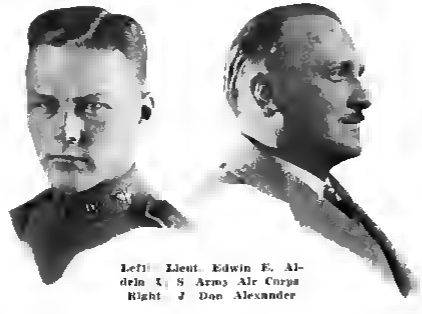
With the production report before them as an outline of the magnitude of their operations and of their merchandising problems, the manufacturers proceeded to details The topics of liveliest general interest were those concerning the relations of the industry with the Department of Commerce, discussed in anticipation of the meeting with the Department's representatives later in the week.

Airworthiness Regulations

IT WAS EVIDENT that the general desire was for stability in the Department's exactions and procedure, rather than that the rules should take any particular form Various manufacturers expressed themselves as wishing to be safeguarded either against sudden changes in airworthiness regulations which would upset production schedules or against arbitrary enforcement of personal ideas by individual inspectors The code of procedure provisionally outlined by the Department of Commerce was discussed and was in general approved It provides for the publication of airworthiness requirements once each year on January 1, and for an open conference of the Department officials with representatives of the industry preparatory to each revision The manufacturers' meeting recommended by resolution that changes in the requirements should be definitely announced six months before becoming effective to give time to get ready for embodying their results in current designs

Some of the manufacturers protested that individual inspectors had tried to force the adoption of their own ideas of good design and expressed a desire for an inspection manual which would set forth in detail the scope of the inspector's authority and the manner in which he was to exercise it, serving both as an instruction book for the inspector himself and as a guide to inform the manufacturer what he might anticipate Mr Paul H Brattain, Washington representative of the Chamber, announced that the preparation of such a manual was in early prospect

Among the detailed regulations, now in existence or suggested for early adoption by the Department of Commerce, the strongest feeling was manifested on the proposed rules to guard against over-speeding of engines by the use of small or low pitch propellers and on those covering the stability and spinning requirements There was evidence of a general feeling that freedom from liability to fall into a spin was more important to safety than ability to remain in for a long time and then come out quickly, especially in those cases in which involved



Left Lieut Edwin E. Aldelin U S Army Air Corps
Right J Don Alexander

and abnormal manipulations of the controls might be necessary in order to force the machine to spin There was a clear consensus among those who made themselves heard that it should in any event be the uniform and permanent policy of the Department of Commerce to prescribe results and not methods, and that, to take a concrete case, if an airplane had adequate stability it should be no concern of the regulating authority whether an adjustable stabilizer or some other device was used as an aid to securing it

Opposition to the proposed regulations prohibiting the use of propellers which would permit the engine to run more than 5 per cent beyond its rated r p m was outspoken from several quarters Objection was made especially on the grounds of difficulty of control and enforcement

A committee of three was selected to interpret the collective views of the industry and take the lead in presenting them to the officials of the Department of Commerce The committee included L V Kerber formerly head of the engineering section in the Department's Aeronautics Branch but now president of the Spartan Company, Captain H C Richardson, lately in charge of aeronautical material for the Navy and now chief engineer for The Great Lakes Aircraft Corporation, and Mr A W Mooney, president of the Mooney Aircraft Corporation

A committee of the Chamber has been at work on the study of a standard accounting procedure for aircraft manufacture and has circulated a questionnaire among all those interested The results were presented at the commercial manufacturers' meeting in the form of a first draft of the proposed standard procedure, including standard forms for sales records, purchase requisitions, cost keeping on manufacturing processes, etc

A point on which there appeared to be general agreement was that the number of aircraft shows should be

rigorously kept down, and that so far as possible they should be held when there would be no competition from other attractions

The chairman told the meeting of the progress that had already been made in developing a standard sales agreement for the use of exporters in determining their relations with their foreign distributors To further aid the exporters a committee is now at work on the development of a general cable code for the special use of the aeronautical industry Assistance has been volunteered from the automobile industry and other quarters where such codes are already in use, and one of the manufacturers at the meeting offered the code already in use by his own company as a foundation for the Committee's work

The directory of sources of supply for materials and parts which has been the subject of discussion at previous meetings of the Chamber was presented at the Cleveland session It includes at present a listing of 80 distinct principal products used in plane manufacture

In closing the airplane manufacturers' meeting Mr Alexander spoke of the success attained by the glider movement, especially in schools and colleges, and urged upon the manufacturers of planes that they do everything possible to aid it as one of the best means of spreading aeronautical enthusiasm and encouraging and assisting potential pilots and airplane owners of the future.

Discounts and Service

BOTH at the airplane and the engine manufacturers' meetings there was discussion of the question of uniform discounts on engines of the relation between the list price of engines and the price to the airplane manufacturer, and of the way in which the servicing of engines should be handled There seemed to be no uniformity of opinion on either subject, and the view was several times expressed that it was too early for the adoption of a standardized practice In view of the complexity of the subject, a special committee was appointed to study it with particular reference to the experience of the automobile industry The committee includes five representatives of each group

Upon servicing, however, the majority of the airplane and engine people concurred that in view of the special shop equipment and training of the personnel required, the servicing of engines should be left in the hands of the engine manufacturers, to be arranged through their local distribution centers Another topic of lively interest to the engine manufacturers was the method of testing engines for approved type certificates There were some individual expressions, but no apparent concert of opinion, that the present rules should be liberalized to permit the making of type tests at the engine manufacturer's own plant, instead of only at the Bureau of Standards or other Government laboratories

Representatives of the engine industry spoke with particular force of their need for a better break-down of the present market, with analysis into its several parts on various bases of classification Regret was expressed that statistical information of the type provided by the Chamber's production survey was not more generally and continuously available and in much more detailed form, and the representatives of certain manufacturers spoke of their own efforts to keep their statistical records complete and up to date and of their desire to co-operate in obtaining such data for the country as a whole.

Meeting with the Department of Commerce

THE MEETING on Friday between the airplane manufacturers and the representatives of the Department of Commerce was presided over by the Hon Wilham P.

An afternoon's crowd in the grandstand at the Cleveland Airport during the Air Races

MacCracken, Jr, retiring Assistant Secretary of Commerce for Aeronautics It was ideally harmonious, the most controversial points having been threshed out and misunderstandings cleared up in preliminary discussion between the department's officials and the committee selected as previously noted, to represent the industry It was suggested that the plan for protecting producers against sudden changes in airworthiness requirements be modified somewhat from the original draft and that, as previously urged in the manufacturers' meeting, there should be a definite interval between the date of announcement of a change and the time of making it effective. The committee report as presented to the meeting proposed that changes in the regulations might be issued at any time during the year but that they should become finally effective only on new designs received by the Department of Commerce more than four months after the issuance of the announcement It was further provided that when an airplane design has once been approved no subsequent revision in rules would affect the construction of machines from that design The definite adoption of such a procedure would be an astonishing concession on the part of the Department of Commerce, which would thereby lose the power to require that an existing design be modified, even after a lapse of a number of months, to take into account new factors of danger which might have required modification in the airworthiness rules subsequent to the design's first appearance

It was further recommended by the meeting that changes in airworthiness requirements might be suggested by any manufacturer at any time, and that recommendations submitted either by manufacturers or by the Department of Commerce itself should be circulated to the industry for comment during the optional period before the change would become fully effective on new designs

A further proposal upon general procedure was that in case of controversy between the Department of Commerce and an aircraft manufacturer the aggrieved manufacturer should have the right to appeal to the chairman of his section of the Chamber to appoint a committee to study the matter If the committee considered such action justified it would be able to throw its own weight and influence and that of the whole industry behind a request to the Assistant Secretary of Commerce for joint discussion and review of his department's previous decision Secretary MacCracken expressed approval in principle of these proposed measures, although there was no definite commitment on the part of the Department of Commerce

Spinning Tests

SPINNING was discussed along much the same lines as in the commercial manufacturers' own meeting Captain H. C. Richardson, and R B C Noorduyn of the Bellanca Company, both indicated their belief that the emphasis should be laid upon the desirability of cutting out spinning entirely first, by eliminating the possibility of spinning from among the design characteristics of the airplane and second by discouraging pilots from allowing under any circumstances the prolonged continuance of any spin which might inadvertently get started. Mr Lawrance, vice-president of the Curtiss-Wright Corporation had a different view He believed that there would be pilots who would in any case persistently spin any machine capable of performing the maneuver and he thought that that should be taken into account in testing the plane and approving it as airworthy. The present rules of the Department of Commerce recognize the probability of the prolonged spin One or two other speakers at the meeting agreed with Mr Lawrance, and even suggested that power spins should be required as a part of the test of each plane

There was objection voiced against the overspeed limitations on airplane engines and propellers and against the present method of testing landing gears by static drop, but no final decisions were reached Secretary MacCracken and his technical aides took the discussion under advisement as a basis for their further decisions "Through the friendly relations of the Department of Commerce and the aircraft industry's trade association, the Aeronautical Chamber of Commerce," Mr MacCracken had said to the assembled manufacturers in taking the chair, "we have been able to set up standards that protect the public and meet the desires of manufacturers" The desire to assure the continued accomplishment of both those ends, without having to sacrifice the interests either of the public or the industry, plainly animated both the governmental and industrial groups at the conference

Standard Fuels

THE INTEREST of the petroleum industry in aeronautical problems was evidenced at the meeting on fuels and lubricants, where eleven different oil companies were represented, along with several airplane engine manufacturers and the Government services. The sense of the meeting appeared to be favorable to the development of standard specifications, so that pilots moving about the country might buy fuel and lubricants by grade instead of having to depend upon a trade name the use of which might be geographically restricted Sentiment was also manifested in favor of the production of fuels of higher quality suitable for developing the full capacity of high-compression engines After preliminary discussion among themselves and with the engine builders the representatives of the fuel and oil refiners held a meeting with the air transport operators for the discussion of fuel standardization and of the grades acceptable, as well as for the study of fueling equipment and methods of servicing at airports and the possible means of modifying them in the interest of greater speed The transport operators and the representatives of the oil companies found it easy to agree that there was room for marked improvement in refueling methods and reduction in the time consumed by the operation in most cases

The fuel companies' representatives collectively viewed with some alarm the occasional practice of giving exclusive concessions for the supply of fuel and lubricant on public airports to a single company. They formally recommended that all airports be left open to the activities of any suppliers of fuel and oil willing to meet with reasonable regulations and put in their own equipment

Maj. E. E. Aldrin of the Standard Oil Company of New Jersey was chosen chairman of the fuel and lubricant section for the coming year

The makers of accessories and materials, like the builders of airplanes, talked at some length on show policy and decided to circulate a questionnaire on that point among their membership It was voted by those present that membership in the accessory manufacturers' section should be limited to the makers of such equipment as appeared in the finished airplane including personal furnishings for the pilot but eliminating manufacturers of airport equipment and other ground accessories The question of limitation of membership, with the object of assuring full responsibility on the part of all members and of keeping the Chamber's insignia a mark of distinction, had also been discussed by the commercial airplane builders Within the limits of the definition of eligibility adopted by the accessory manufacturers, 27 concerns belonging with their section were represented at the accessory meeting The members agreed on the importance of furthering the use of air transportation, and pledged themselves to back a campaign to promote traveling by air James R Fitzpatrick, vice-president of the Haskelite Company, was chosen as permanent chairman of the section

While the airplane and engine manufacturers were closeted in one room and the fuel experts in another, the distributors and dealers were conducting a session of their own, largely for purposes of organization of their newly formed section George Weis of New York was appointed the chairman of the executive committee, which contains six other members representing as many geographical sections

The magnitude of the merchandising problems was impressed upon the meeting with due solemnity and the manufacturers, through Mr Alexander, pledged their support to the co-operative work that the dealers and distributors might undertake and the organizations that they might form It was agreed that the building up of adequate sales organizations, covering the ground completely but without undue overlap, was a major if not the dominant problem of the aircraft industry at the present time About the desirability of encouraging personal travel by air, the distributors and dealers were in hearty accord with the manufacturers of accessories, and they too promised their support to a carefully planned and extensive campaign to encourage the use of airlines by educating the public upon their usefulness The view was freely expressed that travel upon established routes was a necessary preliminary to any development of private flying and private ownership upon a grand scale

Flying School Regulation

ON THURSDAY, flying schools came up for discussion at a special session, and it was made evident that the aeronautical industry, represented by the Chamber of Commerce, and the Aeronautics Branch of the Department of Commerce are going to keep after the "gyp" flying school menace until it is entirely and permanently removed

Collective attention was first given to the problems of flight instruction and the flying school at the conference of the industry with the Aeronautics Branch held in Washington in December, 1927 After considerable argument as to how much instruction a student should have before being sent solo; how many solo hours that student should get in his log book before being granted a license; what equipment a school should have; and many other items, it was decided to let the schools and "so called schools" endeavor to solve their own problems during 1928 If at the end of that time matters were not as they should be, the industry and the Branch would step in and take a hand

Unfortunately, the end of 1928 found sore spots still existing, and during the Chicago Show a flying school committee was appointed by the Aero Chamber This committee working in conjunction with the Aeronautics Branch drew up a set of rules and regulations covering the rating of flying schools throughout the country by the Department of Commerce In the meantime, special legislation introduced and pressed to passage by Senator Bingham enlarged the Department's powers in that field.

At the meeting in Cleveland last week the industry-Aeronautics Branch combination took another step forward in the elimination of quack schools The national flying school committee composed of C S Jones of the Curtiss Flying Service, chairman, Oliver Parks of St Louis, C C Mason of Washington W D Haviland of St Louis, John Bowers of Los Angeles, Jack Frye of Los Angeles, Tex Rankin of Portland, H F Lusk of Oakland, and Cloyd Clevenger of Dallas, adopted a resolution recommending that the Chamber undertake to investigate cases of questionable schools reported by the committee, the general public, or organizations within the industry, the Aero Chamber to give wide publicity to its findings when its investigations are complete

The advertising committee of the Chamber would also help by sending to newspapers and magazines copies of the Chamber's reports with the request that advertising of fraudulent schools and those with grossly inadequate equipment be refused publication

The Cleveland meeting was presided over by Clarence M. Young, newly appointed Assistant Secretary of Commerce for Aviation In his introductory address Mr Young told of the Department's activity in the matter of protecting prospective pilots against unfit schools The Department's action is limited to licensing and regulatory jurisdiction, and it cannot go beyond that limit Therefore it remains for the Aero Chamber to take drastic and vigorous action in the drive against questionable flying schools

The Finance and Insurance Section meeting was devoted largely to the further consideration of problems discussed at a meeting held at the Chamber's Washington headquarters a few months ago Edward Howard, chief of the Regulations Division of the Department of Commerce, again explained the inadequacy of the present system of recording liens on planes sold on the time-payment basis Under the Uniform State Aircraft Law, which is in force in eleven states, the owner of a plane is liable for all damages caused by his plane, whether through his negligence or not, and under federal law, the owner of a plane is also responsible for payment of fines for violation of Department of Commerce regulations

It is therefore necessary to protect the insurance companies against their being responsible for damages claimed against a plane of which they are financing the purchase, and of which they therefore stand on the records as at least nominal owners To accomplish that it was proposed at the meeting that in future a "notification of existing liens" should be filed by the insurance company with the Department The Department will then consider the actual operator of the plane as the owner The proposed changes are to be considered by the attorneys of the aviation financing companies, and briefs will be filed with the Department before final action is taken

According to various representatives of the insurance industry, the present insurance rates in aviation have to be based upon insufficient and incomplete data available on risks incurred They recommended that steps be taken to obtain more definite and complete data on risks, for in that direction lay the hope of lowering aviation insurance rates It was suggested also that there should be a more extensive exchange of personal and credit data between insurance and finance companies on pilots endeavoring to obtain insurance or seeking time-payment financing of their planes.

THE National Air Races, DAY BY DAY

AND IN SUMMARY

By JOHN T. NEVILL

SETTING new and wonderful precedents from nearly every angle the 1929 National Air Races, held in Cleveland from August 24 to September 2, set a new standard which many subsequent meets will take as their goal

True, the same thing was said, and very properly said, of the Los Angeles races last year, but the Cleveland Classic by sheer magnitude, diversity and completeness of character, and smoothness of operation has created a new pattern for outdoor aeronautical Olympiads

It is always easy to find ground for criticism for any meet of this sort and it always will be until the human element is removed entirely but in Cleveland, Managing Director Cliff Henderson, Air Race Chairman Floyd J Logan, President Alva Bradley, Vice President L W Greve and the countless others who had a part in the Races' making, put on a show par excellence, as nearly free from weaknesses as anyone could reasonably expect

The outstanding factor in the 1929 National Air Races was the success attained by the management in injecting nearly every phase of aeronautical activity somewhere into the program Monoplanes, biplanes, and sesquiplanes, landplanes and amphibians, single-engined planes and multi-engined military, naval, and commercial planes, open cockpit planes and those with cabins, high-powered and low-powered machines, auto-giros, gliders, fabric-covered and metal-clad and rigid airships, men and women contestants, derbies from the east and derbies from the west, speed contests and acrobatics by commercial planes and speed contests and acrobatics by military craft—all these, and more, were on the bill

A bird's eye view of the 1929 National Air Races held at Cleveland Ohio

Taken as a whole, the daily program of racing and stunt flying clearly revealed the progress made in airplane performance capabilities during the past year, and pointed also to the growing strength and technical capacity of an industry which is beginning to turn out specialized racing machines on its own account

Although a detailed report of the events of the first Sunday and Monday were contained in last week's issue of AVIATION, for the sake of continuity they are tabulated herewith, with some additional comments.

THE OPENING closed-course event was a civilian 50-mile 10-lap race for planes powered with OX-5 engines It was called off, as some pilots flew the five-mile and others the ten-mile course The remarkable difference in racing skill among pilots of unquestionable general ability became apparent in the very first lap of the first race, and continued a striking feature throughout the week Some of them, but singularly few flew just wide enough as they approached the pylon started their bank at just the right time, and swept around the turning-mark with but a few feet to spare Others made every conceivable error, the commonest fault being to fly directly at the pylon and start the turn too late, sweeping far beyond the mark, as much as two or three hundred yards in some cases, before the turn was complete Some pilots, too, especially those flying cabin machines with but little reserve of power, flew very low and then became uneasy about turning their planes up on their wing tips, edging around the turns with but thirty or forty degrees of bank In the abortive OX-5 contest the turns made by Douglas Davis in a Travel Air were especially notable for their smoothness and closeness to the pylons

Event No. 23, next on the program, was a 120-mile 12-lap race for National Guard planes powered with Liberty engines Maj John S Owens took first at 149.91 m p h Second was Lieut T E Baker, who had flown in from Boston, 148 4 m p h Third, Lieut P R Love, well known as Colonel Lindbergh's former flying mate, 144.58 m p h

The arrival of the women's derby from Santa Monica featured Monday afternoon First was Mrs Louise

Colonel Lindbergh leading two of the "High Hats" in wingtip formation

McPhetridge Thaden in 20 hours, 19 min , 2 sec flying time Second, Gladys O'Donnell, 21 hours 21 min 41 sec Third, Amelia Earhart In the light plane class, first, was Mrs Phoebe Omlie, in 25 hours 12 min 47 sec Second, Thea Rasche, 31 hours 12 min 30 sec Third, Mrs Keith Miller

Arrival of All Ohio Derby. First, M A Speer, 4 hours 22 min 59 sec Second, Lewis Love, 4 hours 43 min 15 sec Third, Barney Zimmerley, 5 hours 13 min 1 sec

Liberty Engine Builders Trophy Race 120 miles, 12 lap course First, Maj J S Owens, 143 07 m p h Second, Benjamin Nasef, 133 72 m p h Third, John Gill, 132 72 m p h Maj Owens and his Falcon got away to a brilliant start with two victories in the first two days

THE FIRST EVENT on Tuesday's program was a race for women contestants only, ten times around a 5-mile course and using planes powered with engines of 510 cu in displacement or less It marked the first appearance in this country of women pilots in closed-course racing Mrs Keith Miller, flying a Fleet biplane powered with a Kinner K5 engine, was the winner, with an elapsed time for the course of 30 min 33.2 sec , and an average speed of 98 73 m p h Second place went to Lady Mary Heath in a Great Lakes Trainer fitted with an American Cirrus engine, flying the course at an average speed of 96 17 m p h Miss Blanche Noyes in another Great Lakes plane took third, averaging 85 12 m p h

Mrs Phoebe Fairgrave Omlie in a Warner-powered Monocoupe actually made the best time over the course, but was disqualified for having missed a pylon Her time was 26 min 41 7 sec and her average speed was 112 38 m p h. Mrs Omlie filed a protest against the ruling, stating that she turned around and circled the pylon before carrying on with the race. This protest was substantiated by Mrs Keith Miller and Lady Heath The Contest Committee of the N A A has not yet ruled upon the protest A distressing feature throughout was

the delay in getting rulings on protests and other controversial questions, or indeed in securing any sort of official judgment on the contests The lap times and speeds on the closed-course events of the first days of the meet were not yet audited and ready for official release when the week of racing was over

A fifth entrant in this race, Miss Amelia Earhart, who flew a third Great Lakes Trainer, was also disqualified for having crowded another entrant on a turn

Despite the limited experience of racing that most of them had been able to secure, the women showed an average of skill and judgment hardly inferior to that of the male competitors A conspicuous feature of the race was the flying of Lady Heath, who was seldom overshooting the pylon by more than twenty yards during any part of a turn She was completing each turn, from passing the pylon at the finish of one leg to swinging around it and passing it again straightened out for the next leg, in approximately 4 sec time which only half a dozen or so of the male pilots were able to beat consistently Some of the least experienced of her competitors were using as much as 12 sec for each turn, in itself enough to cost them 6 or 8 m p h of average speed on a 5 mile triangular course Lady Heath, who of course has had a very extended racing experience in handicap events in England was banking about 60 deg and diving steadily around the turn for a total loss of altitude of some 75 ft on each one Mrs Omlie banked her Monocoupe only about 35 deg and climbed into each turn and dove out of it, a method common to many of the pilots Mrs Miller's turns were notably good, although not up to the standard of her British rival's

The feature of the race was the racing ability displayed by Lady Heath who took the pylons in clean style Lady Heath is of course an old hand at the air racing game, having taken part in many of the light plane meets on the other side of the Atlantic

Due to the direction of the wind while the women were racing the Navy pilots who were going aloft for their daily exercises above the heads of the crowd were forced to take off directly in front of the stands In so doing they laid a smoke screen of dust that enveloped a large part of the field near the home pylon and made it extremely dangerous for the women to make the turn, to say nothing of making the race invisible to the spectators Incidentally dust was most disagreeable throughout the entire race week, getting worse toward the end It is to be hoped that the time is not far distant when airport engineers will have solved this problem which is a dire menace to the participants in air races and an unlimited annoyance to those who have paid out money to be entertained Incidentally, the week's grand prize for optimism should have gone to those who put up signs, facing a grandstand periodically cut off from the field by opaque brown clouds, proclaiming "The National Air Race Association uses ———— to eliminate dust."

SHORTLY FOLLOWING the finish of the women's race, T A Wells roared across the field in his Travel Air D-4000, powered with a J6 Whirlwind, to take first place in the Portland, Ore., to Cleveland derby open to planes powered with engines of 720-800 cu.in. displacement Wells' flying time for the nine-stop flight was 14 hours, 44 min., 10 sec. This race was hotly contested by nine entrants, seven of them completing the course. Charles ("Speed") Holman who was in second place at Milwaukee, was forced down in Sandusky, Ohio, a few miles from Cleveland, and surrendered his position to Lex Rankin in a J6-powered Waco Taper Wing Rankin held his position to the finish and crossed the line with a total time for the route of 15 hours, 26 min., 16 sec. Third place went to Sydnor Hall, flying a Travel Air Speedwing fitted with a J6 Hall's elapsed time was 17 hours, 25 min., 56 sec The rest of the field finished in the following order

W H Emery, Jr., Travel Air BIID, J6 engine, elapsed time 17 hours 42 min. 22 sec., Maj G H Eckerson, Waco Taper Wing, Whirlwind engine, elapsed time 18 hours 14 min. 5 sec., Dick Rankin, Waco, Whirlwind engine, elapsed time 18 hours 41 min 28 sec., W B Clark, Travel Air biplane, Whirlwind engine, elapsed time 25 hours 35 min 26 sec

One of the most interesting events of the day was a 50-mile race for planes with engines of not more than 100 cu in displacement, a survivor of the light plane contests started at Dayton in 1924 Three pilots were entered in this event, first place going to E B Heath in a Heath Parasol monoplane powered by a 27 hp Henderson engine. His time was 47 min 41.3 sec., and his average speed was 62.91 m p h The other two entrants in this race were Freddy Lund in a Heath low wing sport plane and Jack McMiller in a Super Racer powered with a Henderson engine. The Heath Baby Bullet for some reason did not appear. The diminutive planes kept the crowd at rapt attention as they sped around the pylons like so many mosquitoes headed for a lawn party

Another event of a similar class was a light airplane speed and efficiency contest open to planes powered by engines of 275 cu. in. displacement, or less In this contest each of the five planes entered was required to carry at least 0.2 lb of pay load for every cu.in. piston displacement of its engine, the efficiency formula being as follows:

$$\frac{\text{Pay Load } X \text{ (Miles per Hour)}3}{\text{Gas Consumed}} \text{ equals Figure of Merit}$$

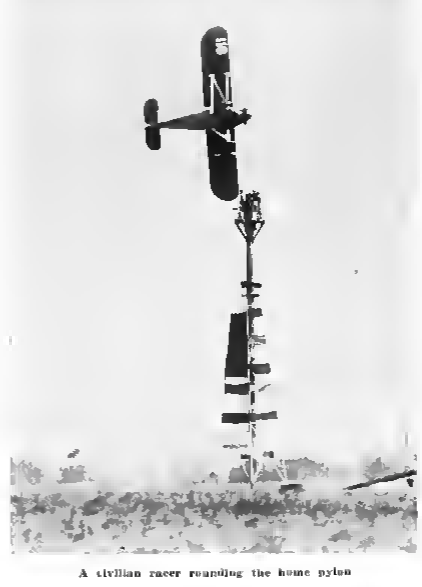
Some of the pilots with low-powered planes protested that that formula, which was used in a number of contests during the week, gave too much weight to speed Theoretically it should equalize perfectly the effect of change of power, other things being equal, and it is much sounder and more logical than most of the "efficiency formulas" that have been developed and tried in the past Undoubtedly, however, it strongly favors a plane with high wing loading and high landing speed

Prizes were awarded both for speed and efficiency, H A Speer, flying a Barling NB-3 low wing monoplane powered by a LeBlond engine, taking first place in both divisions His elapsed time over the 50 mile course was 28 min and 34 sec, and his average speed 105.2 m p h William Burns, in the Heath Baby Bullet, took second place in the speed division with an average speed of 104.68 m p h An Inland Sport monoplane flown by B W Diggle, cornered third position with an average of 100.67 m p h Fourth place went to Lewis Love, piloting a Davis V3 monoplane, whose average speed was 91.41 m p h In the efficiency scoring second, third, and fourth places went to Diggle, Burns and Love, respectively Barney Zimmerley flying a Barling NB-3, was forced out of the race on his ninth lap with engine trouble

The Bullet, with its twenty-foot span, landing gear shod with fourteen inch wheels completely enclosed in fabric, and a fully cowled Bristol Cherub engine driving a 52 inch propeller, again startled the crowd as it had done at Los Angeles The overall height of the machine is only about 45 inches, and the rear five feet of the fuselage have about five inches of ground clearance.

Both Barlings were flying very low and turning nicely Up to the time of his forced withdrawal Zimmerley seemed to be getting around more quickly and smoothly than Speer, who was too low to throw the machine into a bank with comfort without a preliminary climb Burns was also keeping near the ground and climbing sharply into his turns, which were very wide at first but improved notably as the race progressed Zimmerley's time to get around a pylon, like Lady Heath's, was 4 sec

TUESDAY also was featured by the arrival of the Miami-to-Cleveland derby fliers This derby was divided into two classes, Class B being limited to planes with engines of more than 275 and not more than 510 cu. in. displacement, and Class C for engines with a displacement ranging between 510 and 720 cu in. George E. Halsey, flying a Challenger powered Rearwin Ken Royce biplane, won first prize money in the Class B field Halsey's elapsed time was 12 hours, 42 min and 045 sec Other prize winners in this class in their order of standing were C D Bowyer, Comet-powered Cessna, 12 hours, 59 min 10.75 sec., and J. Carroll Cone, Challenger Commandaire, 13 hours, 30 min., 35.5 sec., Leslie H. Bowman, in a Kinner Monosport, took first place in the Class C race, his elapsed time being 12 hours, 44 min., 22.5 sec. A Warner powered American Moth, flown by Robert Dake, took second place in this class, while third place went to Charles W Meyers in a Cirrus powered Great Lakes Trainer, and fourth position went to Earl Rowland, who flew a Warner-equipped Cessna.



A civilian racer rounding the home pylon

Col Charles A Lindbergh, who had made his initial appearance at the races on Monday provided one of Tuesday's major thrills by going aloft with two members of the Navy "High Hat" squadron, from San Diego. He led them in a remarkable exhibition of close formation flying, as well as group acrobatics The Colonel's "bag of tricks" included flying inverted while leading the V formation back and forth before the grand stand, and a breath-taking landing in front of the stands immediately after cutting his engine while finishing a loop With Lieutenants F O Kivette and Frank O'Beirne, of the nine High Hats, Colonel Lindbergh made the 15 min flight a daily feature of the races thereafter The planes used, of course, were Boeing fighters of the F2B1 model, the first to go into production with a Wasp engine Tuesday's exhibition marked Lindbergh's first appearance as a member of a naval stunt team It will be recalled that he and two crack Army fliers were featured attractions at the Los Angeles races last year

Another accomplishment, that is worthy of mention, on Tuesday's bill was a series of seven consecutive outside loops made by Bert Mackie in a J-6 powered Waco Taper Wing Although there are no official figures for such things Mackie was credited with having set a new world's record for outside loops, the previous record of six having been held by Lieut Al Williams of the Navy.

WEDNESDAY'S AERIAL FESTIVITIES included the arrival of the Philadelphia and Oakland derbies, as well as the arrival of the United States Navy's dirigible "Los Angeles," and drew probably the largest attendance of any day of the races Between 85,000 and 100,000 persons were estimated to have visited the airport

Eric Williams, at the controls of a J6-powered Eaglerock Bullet, roared across the finish line at 2 35 48 p m, being the first entrant in the Philadelphia derby to finish the grind His elapsed time for the route gave him first place in that event The Bullet was followed less than five minutes later by a Bellanca CH-300, flown by J Wesley Smith, who took second money Six additional pilots finished in the following order: Ike Stewart, J-5 Monocoach, Howard Young, J-6 Bellanca, "Bob" Hewitt, J-6 Travel Air, Lloyd O Yost, J-5 Fairchild FC-2, Sidney Riley, J-6 Travel Air, and Henry Little, Warner Monosport Like the women's cross-country derby the Philadelphia derby was marred by tragedy, E. J (Red) Devereaux, pilot of one of the starters, his wife and his mechanic, Edward Reiss, being killed in Boston when their plane crashed when about to land at that stopping-place As a result of the accident another entrant using the same type of monoplane was withdrawn from the race. The Philadelphia derby was open only to planes of the cabin type

Loren W. Mendell, pilot of the re-fuelling endurance record-setting Buhl, "Angeleno," sped across the Cleveland airport at 2 50 56 p m, to win first place in the Oakland to Cleveland derby open only to open cockpit or mail type planes In the derby Mendell used the Buhl Airsedan, powered by a 300 hp Wright engine, presented to him and L. B Reinhart by the Buhl Airplane Company following their endurance flight Second place in the Oakland derby was won by Joe Barrows in a Kinner powered Fairchild KR biplane, and third went to Capt J O Donaldson, in a Whirlwind Travel Air.

Wednesday's throng at the airport witnessed the first public exhibition of an airplane being attached to an

airship in flight Lieut A W Gorton of the Navy flying a Vought fighter, accomplished the feat at an altitude of about 3,000 ft just behind the grandstands after two preceding attempts made over the airport had failed With the propeller of the Vought idling and the Los Angeles sliding along at approximately 40 m p h Lieut C M Bolster, of the dirigible's crew, climbed down through the bottom of the airship and became a passenger in the airplane After nearly 10 min of being carried along as a fixture on the Los Angeles the airplane was dropped loose, dived for flying speed and clearance, and then circled down to a safe landing before the astonished crowd Lieutenant Bolster was introduced to the spectators as being the first man to be transferred from a lighter-than-air to a heavier-than-air craft while both were in motion After the transfer was made the giant airship also descended and was moored, until the following morning, at the combination mooring mast-pylon before the stands

THE WEDNESDAY AFTERNOON PROGRAM also included the OX-5 race which had been run off on Sunday but had been declared no contest because some of the pilots flew around the 10 mile pylons instead of the 5 mile markers This event, open to all type planes powered by Curtiss OX-5 engines and having two or more seats, included 8 laps of a 5 mile course, and was won by Douglas Davis, in a Travel Air, who flew the course at an average speed of 104 94 m p h and in an elapsed time of 22 min, 57 47 sec W E Winkle, in a Brunner-Winkle "Bird," was second, with an average speed of 100 74 m p h, and P H Spencer, in Curtiss Robin, finished fourth with 98 32 m p h There were eight entries in the event

Douglas Davis' turns were again conspicuously good but the general average was much better than the first day, and few pilots were requiring over seven sec for a turn Dale Jackson, in a Curtiss Robin, was getting around with very little lost motion as long as another Robin managed to stay in front of him, but after catching up with it and passing it he began to overshoot the marks a little more Mr Winkle flying one of his own planes, made by far the most spectacular turns, although not the fastest throwing the plane very sharply over into a bank sometimes passing well beyond the vertical The general tendency was to fly lower than during the first attempt to run the race

Shortly before noon, and before the huge afternoon crowd had gathered at the airport, a transfer was made of fuel and supplies from an army Douglas observation plane to the Boeing mail plane "Shuttle," being flown across the nation by Capt. Ira Eaker under sponsorship of the Army, the Postoffice Department, and the Boeing company to test the feasibility of fueling loading and discharging cargo in flight. The Shuttle at the time was enroute to New York on its west to east journey Later the same day, after having returned from New York the Shuttle was forced down on the Cleveland airport when an oil can accidently dropped from the re-fueling craft struck the lower plane's wing and broke an oil line

Thursday's racing program at the airport began with a 60-mile race for women pilots only. Six entrants started, the contest calling for 12 laps around the five mile course, and for planes equipped with engines having a piston displacement ranging between 510 and 800 cu in This event furnished the fair pilots with their second opportunity to display their skill at closed-course airplane racing—and the skill was displayed Considering the equipment the race was flown at an exceedingly high average speed, and a number of the girls showed an amazing ability to round the pylons with a minimum loss of time Gladys O'Donnell, at the controls of her Waco J-5 taperwing, who took the lead right at the start, sped over the finish line, the winner, with an average speed of 137 6 m p h Just behind Mrs O'Donnell, and taking second prize, was Mrs. Louise Thaden winner of the women's Los Angeles Cleveland derby, who flew her J-5 powered Travel Air equipped with an N.A.C.A. cowling at an average speed of 131 43 m p h Miss O'Donnell's elapsed time for the 60 miles was 26 min 9 8 sec, while that of Mrs Thaden was 27 min 23 5 sec Mrs. Blanche Noyes in a Travel Air J-5, also having a N.A.C.A. cowling, took third place with an average speed of 127 77 m p h The quality of the flying in this event was better than in the ladies' first attempt A shadow was cast over the women's competition by the news of the serious accident that Lady Heath had suffered on Thursday morning, its outcome for her still being very uncertain for several days thereafter

THE NEXT RACING EVENT was a 10-lap grind around a 5 mile course and open to planes powered with engines having a piston displacement of between 275 and 510 cu in There were so many entries in this event, known officially as Event No 9, that the race committee was compelled to settle the matter in two elimination heats and a final In the initial heat, held Thursday, 11 planes competed, eight of them qualifying for the finals Those proving eligible, in order of speed shown in the first heat, were Verne L. Roberts, Warner Monocoupe, 129 18 m p h., R T Qumby, Warner Monocoupe, 128 09 m p h, C E Clark, Chevrolet low-wing Travel Air, 126 14 m p h., Charles W Meyers, Cirrus Great Lakes Trainer, 122 m p h W G Moore, Warner American Moth, 116 73 m p h., H A Little, Warner Monosport, 114 34 m p h, Leslie Bowman, Warner Monosport, 114 08 m p h., and A P Krapish, 112.22 m p h

The crowd was then treated to another display of speed by planes of the midget class Event No 5, calling for ten laps around the five mile course and open to planes of all types equipped with engines of 275 cu in displacement or less started with six entrants E B Heath in his Baby Bullet sped around the course at an average speed of 109.46 m p h to take first place A Barling NB3, LeBlond powered and piloted by H A Speer, was second with an average speed of 105 93 m p h and an elapsed time of 28 min 19 2 sec. Third place went to Lewis Love in a Davis monoplane also equipped with a LeBlond Love's average speed was 105 6 m p h and his elapsed time was 28 min 24 6 sec

Planes of the Navy "Fligh Hal" squadron attached to the 'Saratoga' lined up for "action"

ONE OF THE FEATURES of the afternoon was the arrival of the Toronto-Cleveland derbies The first of them, known as the Canadian Commercial Derby, had six entries and was won by Herbert St Martin in a Wasp Travel Air who flew the route in 2 hours 10 min 24 sec W J E Johnston in a Buhl Airsedan, J6 equipped, took second honors in 2 hours 13 min 14 sec J G Craig in a J5 Buhl and T F Williams in a Hisso Eaglerock finished third and fourth respectively Only four of the six starters finished

The second derby, known as the Canadian Club derby had four entries, all of whom used Gypsy Moths and finished in the following order First, K E Whyte, 3 hours 26 sec; second R C Guest 3 hours 2 min 59 sec; third, G N Irwin, 3 hours 14 min 26 sec; and fourth, L J Tripp, 3 hours 19 min 37 sec

The third closed course event of the day was Event No 13, a 10 lap 5 mile course race open to planes powered with engines of 720 cu in displacement or less After a beautiful exhibition of pylon turning and picking up speed on a dive down the straight-away, Eric Williams zoomed his J6 Eaglerock Bullet up from the finish line with first place in his possession Williams made an average speed of 134 58 Second place money went to E V L. Roberts who also gave the crowd a lesson in pylon turning in his Warner powered Monocoupe His average speed was 128 84 m p h R T Quimby, in similarly equipped Monocoupe took third place money after remaining on Robert's tail with an average speed of 128 15 m p h C D Bowyer in a Warner Cessna just slipped into the money with an average speed of 126 61

There was a total of eleven aspirants in this event which resulted in many exciting group turns around the home pylon As a matter of fact it was pylon-turning ability that enabled Williams to bring home the bacon During one of these thrilling junctures H S Myhres in a Simplex monoplane, all painted up like a race horse, failed to come out of his pylon dive and bounced his wheels off the ground in a cloud of dust For a second it looked as though Myhres were headed for a crash, but instead he zoomed high enough to make a 90 deg turn into the wind, and brought the Simplex down on one wheel and a wing "Swanee" Taylor, the announcer, termed it "no runs no hits, no errors"

The closing exhibition of the day was a stunting show by three Canadian Royal Air Force pilots, Flight Lieutenants F E Beamish, E A Harding and G R Howson Their planes were Armstrong Siddeley Siskin fighters, all-metal single seaters, powered by 425 hp Jaguar engines The show that they put on was without question the most thrilling of any team flying during the week Very little time was spent in formation flying, in fact, only enough to permit the visiting trio to gain sufficient altitude Then they broke loose and proceeded to show Cleveland and its visitors how they stunt in Canada Not a single trick was missed, and, as a matter of fact a new one to American pilots was demonstrated This was called the "double bunt" It starts with half an outside loop, and when the pilot is on his back at the bottom he cuts the gun and floats across the field, after which he half rolls out The thrilling part of the exhibition was when the trio strafed the crowd and virtually rolled their wheels off the straw hats When there was hardly a breath left in the crowd, the trio landed in formation on the far side of the field, and taxied up to the stands By that time the spectators were almost back to normal and

Mayor Marshall fourth from left front row opens the 1928 National Air Races

they proceeded to give the visiting guests the best hand of the meet thus far A wonderful exhibition, but one that was far too close for comfort and safety. It set a bad example

When informed that the Siskin planes are high altitude fighters and are not at their best near the ground one pities any enemy plane that might run afoul of the Canadian boys that visited Cleveland

Although the Mason M. Patrick trophy race and the Navy's pursuit race, both regarded as annual classics in the respective branches of the Service, took place Friday afternoon, probably the major thrill of the day was served the crowd by a lone pilot in a three-ton tri-engined transport plane several thousand feet above the field This pilot, one Charles "Speed" Holman, who has broken into print on a number of previous occasions by his unusual aeronautical accomplishments, proceeded to prove to the 50,000 or more spectators that a Ford all-metal monoplane is not nearly so staid and dignified as it looks As a surprise feature of the afternoon's entertainment it had been announced that Holman would take the Ford up on a stunting expedition Since Ford planes are known to be designed for more practical purposes, it really was a surprise when Holman began to make the monstrous plane cut capers Altogether the Ford, powered by three Wasp engines, executed a total of five perfect loops, several steep climbs, one or two wingovers, a stall or two, and, best of all, a flight of about a minute's duration upside down, this flight being begun while on top of a loop. The crowd took so well to this amazing demonstration that Holman repeated the performance the following day. Friday's performance was

not the first time a Ford had been looped, nor the first time Holman had looped one, but it is safe to say there were not more than a score of persons among the thousands on the ground who had ever seen one stunted before.

Another interesting solo exhibition staged Friday afternoon was the flying of Lieut Harry Johnson, of Selfridge Field, Mich., in a Curtiss P-1, equipped with a Prestone cooled D-12 engine. A third was a demonstration of prolonged inverted flight by Lieut "Tex" Rogers, of the Marine Corps, in a Marine Corps Curtiss Hawk, equipped with an especially built carbureter and oiling system. In Johnson's plane the radiator is one third normal size and filled with Prestone liquid designed to keep the engine operating at a temperature of 300 deg F.

Thirteen pilots of the Third Attack Group from Fort Crockett, Tex., participated in the Mason M. Patrick trophy race, which is limited to members of that group. The race consisted of 8 laps of the 10-mile course. The trophy in this race was donated by the Hon F. Trubee Davison, assistant secretary of war, as a perpetual tribute to the former chief of the United States Army Air Corps. It was competed for for the first time at Los Angeles last year.

Popular superstition notwithstanding, the race was easily won by Lieut. Ivan M. Palmer, whose plane was the much shunned number 13. Lieutenant Palmer's average speed was given out as 140.2 m.p.h., which incidentally, is just seven tenths of a mile faster than the time set by Lieut. G. R. Acheson, who won the event last year. The lieutenant took the lead shortly after his dive for the opening pylon and lengthened it consistently. He averaged a speed of 152.73 m.p.h. on his fifth lap and reached his highest speed on the seventh with an average of 154 m.p.h. Second place in this race went to Lieut. G. F. Kinzie, whose average speed was 138.84 m.p.h. Lieut. F. M. Ziegler flew the course at an average speed of 136.14 m.p.h. to take third position.

The next racing event of the afternoon was a relay race for male contestants, each plane being manned by four pilots, the pilot being relieved after three laps around the five-mile course. A Bird biplane flown by pilots Douglas Davis, C. E. Clark, George Gill and J. E. Goochey, won the event in an elapsed time of 37 min. 12.6 sec.

The Navy metal clad airship passing over the Judges' stand

SUCCEEDING THE RELAY RACE the semi-final heat of Event No. 9 was flown. Out of eight starters Clarence Chamberlin, in a plane of his own design, grabbed off first place with an average speed of 114.8 m.p.h. Chamberlin's elapsed time was 26 min. 07.9 sec. Parker Cramer, at the controls of a Warner-powered Cessna averaged 112 m.p.h. to come in second.

From the standpoint of expected speed the next event, the Navy Pursuit Plane race, was a bit disappointing. However, due to the number of pilots entered and the unusually large number that found themselves jockeying for advantageous positions on the pylon turns, the race proved highly exciting to those in the stands. It might be explained here, as it was explained to the spectators, that the sea-going pilots, coming from San Diego, flew a long and somewhat hazardous route to the Air Races, and, of course, intended to return to their base following the Cleveland classic. This fact, no doubt, accounts for the fact that, without exception, the 14 pilots flying the 100 mile course seemed to hold their charges in check. Lieut. M. E. Arnold, flying plane No. 19, managed to get his name on the much coveted trophy by covering the 100 miles in 43 min. .041 sec., averaging 127.58 m.p.h. It will be recalled that the winner of the same race at Los Angeles last year averaged 148 m.p.h. Approximately 12 seconds behind Arnold, Ens. C. C. Ironmonger roared across the finish line to take second place. Ensign Ironmonger's elapsed time was 43 min. 16.9 sec. and his average speed, 126.97 m.p.h. Just to prove that one cannot keep a good Navy man down, Lieut. C. K. Lankford, still bandaged from a minor crack-up experienced just before the San Diego crowd reached Cleveland, pushed his Boeing F2B into third place, with an average speed of 126.5 m.p.h.

Saturday was termed Engineers Day and all festivities were dedicated to Thomas A. Edison. Mr. Edison and Henry Ford and Harvey S. Firestone were to have been the guests of honor, but due to illness Mr. Edison and Mr. Ford were unable to be present. Mr. Firestone, however, was among those present and the crowd showed its appreciation when he was presented from the announcing platform. Other celebrities who attended included Assistant Secretary W. P. MacCracken, Jr., Assistant Secretary F. Trubee Davison, and Senator Hiram Bingham.

Aerial hostilities opened with a hair-raising Army Pursuit plane race of 10 laps over a 10 mile course, for the John B. Mitchell Trophy presented by Gen. Wm. Mitchell in honor of his brother killed in France. This event has been competed for since 1921 and is the goal of every Air Corps pilot. In fact an Army pilot wants his name on the Mitchell Trophy as badly as the old commercial racers wanted their names on the famous vest of "Casey" Jones.

There were eighteen boys with D-12 Curtiss Hawks that took part, and they were all from the nest of the Air Corps' crack pursuit pilots, Selfridge Field, Mich. The event was started by the entire group taking off in 'V" formations of three planes each, two Vs getting off at the same time. When all were off and well clear of the field the leader, Maj. Ralph Royce, waggled his wings and dived for the home pylon. The second plane followed suit and so on until all were roaring down over the heads of the crowd. So many competed in the race that by the time the last plane had gone upon its way Major Royce could be spotted banking around the third pylon.

From then on it was a great and thrilling game of "pylon, pylon, who's got the pylon". At no time were all of the planes out of sight and on several occasions four and five planes roared at the home pylon in a bunch. To substitute figures for generalities, after having had a hundred miles in which to spread out one group of three ships crossed the finish line within a total time of 0.6 sec., spaced about 25 yards apart, and five finished within a total of five sec. Considering the amazing proficiency of the members of the group in formation flying, their work on the pylons was very spotty, and there was a remarkable lack of agreement about the best manner of making a racing turn. Some were exceedingly good, others distinctly slow, and the time for completing the swing around the home pylon ranged from 2.4 to 11 sec. Angles of bank were from 60 degrees to beyond the vertical. It would be impossible to pick out any one pilot as doing the best work, but the turns made by Lieuts. A. L. Moore, Morgan, Warburtoo, Pringle, and Schoenlein were particularly impressive. Lieut. Richard E. Cobb gave the crowd incipient heart failure on each lap by doing near-wingovers and coming out at from ten to thirty feet above the ground. His time on turns was shorter than any of his group-mates could show, but the plane was pulled around so sharply that there must have been serious loss of speed and there certainly was a very substantial loss of altitude which had to be regained by climbing on each straighaway. As he finished, Lieut. Cobb rolled his machine 90 degrees and used his momentum to climb several hundred feet with the wings in a vertical plane. He had narrowly escaped a crash near the end of the race, when a commercial plane took off across his course just as he was rounding a pylon. The Army pilots almost without exception avoided one mistake common among the civilians, that of starting the bank too late. Most of them flew from 100 to 300 ft. high and began to roll their planes while still a couple of hundred yards short of the pylon.

The winner of the military merry-go-round was 2nd Lieut. P. B. Wurtsmith. His time was 36 min. 6.8 sec. and his average speed 152.173 m.p.h. The honors for second place were split by 2nd Lieut. A. L. Moore and 2nd Lieut. K. E. Rogers. Both piloted their Hawks over the route in 36 min. 8.7 sec. at an average speed of 152.04 m.p.h. Third place was won by 2nd Lieut. E. K. Warburton who hung up an elapsed time of 36 min. 11.9 sec. and an average speed of 151.816.

A COMPARISON of the times set up by the first four in the Army race gives one a good idea of how evenly the Hawks were matched. An item of interest, though, in connection with the speeds attained is that although the winner's speed was the highest of the meet as regards service races, it was the slowest of any Mitchell Trophy race in the last six years.

While the Army boys were skidding around the pylons the competitors in the Round the Rim of Ohio Derby set their wheels on the "floor" and taxied up to the judges' stand. Four of the boys had hopped off on Friday and three of them finished the flight. The winner was J. O. Donaldson, who piloted his J6 open Travel Air over the route in an elapsed time of 4 hours 48 min. 11 sec. Next in line was W. J. Barrows, who set up a time of 4 hours 53 min. 47 sec. in his Wasp powered Fairchild cabin monoplane. And the last chap "in the money" was Loren Mendell, of endurance fame, who made the route in his J6 Buhl in 5 hours 3 min. 9 sec.

THEN THE MARINES proceeded to "get the situation well in hand" by staging a six plane, 8 lap, 10 mile course race. The planes used were the standard Marine pursuits fitted with Wasp engines. Like the Army they also took off in formation, then strung out in line and went for the first pylon in a hurry. As there were only six entries there were very few cases of such bunching as had made the Mitchell Race sensational. Most of the time they were in "follow the leader" style. Lieut. Haynes Boyton carried off first prize by making the route in 30 min. 46.4 sec. at 142.88 m.p.h. Second place was won by 2nd Lieut. W. C. Brice in 30 min. 59.4 sec. with an average speed of 141.88 m.p.h., and third place went to Sergt. B. F. Belcher with a time of 31 min. 13 sec. and an average speed of 140.85 m.p.h.

The Marines showed much more consistency in their racing policy than either the Army or the Navy. One might almost have suspected the race of being rehearsed in advance, so uniform was the style. Starting the bank somewhat later and more abruptly than most of the Army pilots, they came up to the vertical or within ten degrees of it and then swung around without any preliminary climb and with a loss of about 50 feet of altitude at each pylon. The three prize-winners were particularly close to type in their racing tactics, and they were particularly good, their turning time as previously defined running from 3.2 to 4 sec., less than any of the Army officers except Lieuts. Cobb and Moore.

While the Marine racers were in the air, one of their brother officers, Lieut. "Tex" Rogers, was showing the crowd how one flies on one's back for an indefinite length of time. Lieutenant Tex had a Marine Hawk especially equipped with a special oiling and carburation systems which enabled him to carry on with full engine when on his back. More eyes were on Lieutenant Tex than on the racers. In fact the race was over before the crowd had ceased to get an eyeful of the "upside-down" pilot.

Because the crowd had been able to more or less follow the progress of the races put on during the first part of the afternoon, the contest committee proceeded to hold an event known as an Australian pursuit race for men. The race was a 15-lap handicap affair over a 5-mile course, and the idea was that whenever a plane had been passed by another it was to drop out. All entries had been flown for handicap times, and were lined up in order and flagged off at intervals. The handicaps were so varied that some planes had circled the course several times before others were even started. And so the spectators, or at least those without

previous experience in figuring out 6-day bicycle races, spent an hour trying to decide who was ahead and who was behind. On several occasions the "leader" would come roaring by, and then when he came around again he would glide down to land, and the crowd would guess again. Finally the judges announced that A. P. Krapish in a Gypsy Moth had won. His actual time was 39 min. 25.9 sec., his handicap time was 50 min. 59.8 sec., and his average speed 114.12 m.p.h. Second place went to J. Carrol Cone in a Fairchild KR with a Challenger engine. His actual time was 39 min. 53.6 sec. and his handicap 51 min. 31.1 sec., and his average speed 112.8 m.p.h. Third place was won by the slowest plane in the race, an OX Eaglerock flown by R. C. Wonsinger. His actual time was 51 min. 32.2 sec. And his average speed was 87.32 m.p.h. The Eaglerock, with the only war-time engine in the race, had no handicap and was first in the air. In fact he was allowed such a head start that he threatened to establish a solo endurance record before the second entry was flagged off. Eleven entries started the race, but it was not long before they began to come down one by one. There was no spectacular turning, but those of Eric Williams in an Eaglerock Bullet and of Krapish and Wonsinger were very good.

BEFORE THE CROWD had had a chance to get back to normal after trying to figure the men's Australian pursuit race, several members of the fair sex lined up and started off on a women's Australian Pursuit race. They were scheduled to fly 12 laps over a 5-mile course.

The winner was Gladys O'Donnell who flew the route like a veteran. In fact, Miss O'Donnell took the home pylon on several occasions in less time than was caught for any other competitor at the meet, man or woman. She brought her Waco taper wing around very smoothly with about 75 degrees bank and very close indeed to the pylon, losing about 50 ft. of altitude steadily during the turn. She made one turn in 2.2 sec. and a number in under 3 sec. The next best turns were those of Mrs. Thaden, who used a Travel Air and whose turning time was a little longer. She probably lost somewhat more speed in turning, as she climbed in approaching the pylon. Frances Harrell, flying a Moth, was also very good. Miss O'Donnell gained on her field so rapidly that there was no mystery to the spectators about her having been the victor.

The main feature of the Sunday events was a superb display of flying by Lieut. Alford J. Williams, of the Navy, and the high spot in this brilliant exhibition was his circuit of the airport while flying the plane in the inverted position. Lieutenant Williams followed the general outline of the regular race course and made his turns with about a 50-degree bank while flying upside down. One of the turns was around the home pylon and it was smoother, closer to the pylon, and generally accomplished with less loss of time and distance than 75 per cent of the week's turns around the same mark in actual competition, in spite of the unusual attitude of the plane and the fact that the pilot was on the outside of the bank.

Williams did not lose altitude during this inverted "race" around the course and in crossing the usual finish line he dove slightly, coming out in an inverted zoom which developed into a vertical climb and on over into the normal horizontal position. His bag of tricks included, also, a beautiful and indisputable outside loop; a number of smooth, slow rolls, and an "upside-down" landing. Eventually he came in to land still flying on his back, then rolled over onto his "feet" within 200 ft. of the ground. He used a Curtiss Hawk. A number of the "outside loops" made during the week, incidentally, were quite sketchy, and ended up with part of an inverted spiral and part of a roll.

Not long after Williams' flight, Lieut. James H. Doolittle of the Army, took the air, fresh from his initiation into the Caterpillar Club. Just previous to Williams' flight, Doolittle had taken off in a modified Hawk which the Army had been using at Wright Field for experimental purposes. It was Prestone-cooled. He went about 5 miles west of the airport to practice a bit. While in a long straight power dive the wings washed off and Doolittle had to jump. The accident was not seen from the airport, and the first knowledge of it there came when Doolittle entered the Army office and asked for another plane.

IN SPITE OF that hair-raising experience and of an engine which was not fitted for upside-down work, Doolittle maneuvered well and executed some inverted flying, including a turn while flying upside down. The engine sputtered and lost power disconcertingly each time an inverted maneuver was tried.

Another stunting show of a somewhat milder nature but nevertheless very impressive was given by Douglas Davis on the Travel Air mystery monoplane. Some of

Doug. Davis and his record breaking Travel Air "Mystery" plane

the technically-minded spectators were a little nervous about the display because of the very flat angle at which the bracing wires attached to the wing, in accordance to usual racing monoplane practice, but Davis did a string of loops and slow rolls, both horizontally and upward, without a sign of trouble of any sort. The machine had such an enormous reserve of power that it seemed to travel in any attitude or direction, including upside-down flight and flights vertically upward, quite normally and under full control.

T. A. Wells, of Wichita, won the race for open cockpit planes powered with engines of not more than 800 cu. in. piston displacement. He flew the 150 miles in a Travel Air D 4000 (Whirlwind Nine) in the

Refueling the metal clad airship at the 1929 National Air Races

elapsed time of 30 min. 32.6 sec.—a speed of 147.37 m.p.h. H. S. Myhres, flying the trim Simplex low wing monoplane with a Whirlwind Seven, was a close second, making the course in 30 min. 54.7 sec. with an average speed of 145.56 m.p.h. Sydnor Hall flew a Travel Air Speedwing (Whirlwind Nine) to third position with an elapsed time of 32 min. 6.8 sec. and a speed of 140.13 m.p.h. "Speed" Holman made the fastest time on this race but was disqualified for turning inside one pylon.

The cabin planes had their inning next. Engines were required to be of 800 cu. in. piston displacement or less. R. W. Cantwell, flying a Lockheed Vega with a Wasp won this event with an elapsed time of 23 min. 38.5 sec.—and an average speed of 152.7 m.p.h. Close behind him came Roscoe Turner, in another Vega with a Wasp engine, his speed 150.15 m.p.h. J. Wasley Smith finished third in a Bellanca with a Whirlwind Nine at a speed of 135.8 m.p.h.

The fastest turns in this race were made by Smith in the Bellanca with the winner, Cantwell, ranking as second best in that respect. The Bellanca was being brought around the pylon in less than 4.5 sec., which would have been rated as good time for a small open-cockpit machine. Both Bellancas piloted by Smith and by George Haldeman, flew very low, Smith in particular travelling at about 40 ft. on the straightaway and climbing slightly on the turn, and both banked within about 10 deg. of the vertical. The Lockheeds, especially Cantwell's, were flown considerably higher and not banked as steeply.

Excellent piloting especially at the turns, added to the fleetness of his Eaglerock Bullet, enabled Eric Williams to turn in the best speed in the Aviation Town and Country Club Trophy speed and efficiency event. His elapsed time was 26 min. 35 sec., giving him 133.75 m.p.h. for the 120 miles. The plane was powered with a Whirlwind Seven. Right behind him came a Monocoupe (Scarab) and a Monocoach (Wright). The former was piloted by Verne L. Roberts for a speed of 129.43 m.p.h. The second, flown by R. T. Qumby, was almost a minute behind, covering the course at the rate of 127.57 m.p.h. Ruberts did particularly well on his turns.

The highest score for efficiency in the Town and Country event was given unofficially to George W. Haldeman, flying a Bellanca, with a total of 253.19. Williams won second place with 193.65 points, and C. P. Boyer was third in a Cessna with 141.31 points. These figures are subject to revision. Planes were required to carry 0.5 pay load per cubic inch of engine displacement.

As already indicated, the best maneuvering around the pylons was that of Eric Williams, who had been consistently good in all his races throughout the week. He started with about 70 deg. of bank, flying very low and climbing into the turn, but later increased his bank to about 85 deg. near the end of the race. Clarence Chamberlin chose to fly wider and take the turns more gently, banking only about 60 deg. and also flying quite low. Staying close to the ground, indeed, was characteristic of most of the pilots of cabin monoplanes in most of the events.

Thea Rasche flew a Gypsy Moth to victory in the second heat of the 60-mile Australian pursuit race for women. Her elapsed and net time was 36 min. 6 sec., and her average speed was 99.72 m.p.h. Mrs. Thaden in a Travel-Air (Wright J5C) was second with an elapsed time of 26 min. 18.6 sec. and a net time (which includes the handicap allowance) of 36 min. 6 sec. Her speed was 136.83 m.p.h. Mrs. Keith Miller was third in a Fleet (Kinner), and Gladys O'Donnell was last in a Waco Taperwing (Whirlwind). The flying of the women in this race again was characterized by the excellence of their turns, major honors on that point again going to Miss O'Donnell, who was almost but not quite as good as on the previous day.

At 5.15.07 P. M., Henry J. Brown, of Cleveland, arrived from Los Angeles in the non-stop race, bringing his Lockheed Air Express (Wasp) over the course in 13 hours 15 min. 7 sec. at the rate of 156.4 m.p.h. He won this event against Lee Schoenhair, the only other pilot to complete the event within the rules. Roscoe Turner arrived after the daily time limit had expired.

THE SPEED RESULTS of the Detroit *News* 80-mile transport and efficiency race credited R. G. Lockwood, flying a Fairchild 71 (Wasp) with first place. His elapsed time was 34 min. 31.2 sec. and average speed 127.37 m.p.h. George W. Haldeman was second in a Bellanca (Whirlwind Nine) with an elapsed time of 36 min. 39.2 sec. and speed of 119.97, m.p.h. J. Welsey Smith was third in a Bellanca (Wright J-5) with an elapsed time of 39 min. 39.3 sec. and a speed of 113.74 m.p.h. It was later stated that Lockwood had been disqualified for taking too long a take-off run.

The unofficial efficiency results for this event gave Clarence Chamberlin first place. He flew a Crescent, winning 519.8 points. Lockwood was second with 360.88 points and Haldeman third with 342.35 points.

These figures are subject to revision Each plane was required to carry a minimum pay load of 1,000 lb and get off within 900 ft at a speed of not less than 80 m p h With a limitation on take-off distance, rather than on "unstick" time, the amount of pay load that could be carried obviously depended largely on the strength of the wind

During the afternoon the First Pursuit Group, a Marine Corps group and the trio of High Hats led by Colonel Lindbergh put on their usual exhibitions The Travel Air and Waco stunt teams also did their stuff The feature of the First Pursuit Group display was a formation of planes arranged to spell "A C" for Air Corps and "A" for Army The latter alphabetical experiment had been attempted once before during the week While very good, it has been by no means perfect On Sunday it was greatly improved Of fourteen planes only one was perceptibly out of position as they approached the stand, and that one but a few feet A brilliant exhibition

Arthur J. Davis of Lansing, Mich., took first place in the second section of the 75-mi Australian pursuit race for men He flew a Waco Taper Wing (Whirlwind Nine) over the fifteen laps in an elapsed time of 48 min 26 1 sec S J Whitman, of Fond du Lac, Mich., finished second in 49 min 27 1 sec, while George Haldeman won third honors in a Bellanca with a time of 51 min 26 8 sec The speed of the planes was not computed, since it was a handicap event

AKRON DAY was celebrated on Monday, September 2, in recognition of the lighter-than-air interests, and as guest of honor the meet entertained Dr Hugo Eckener, commander of the airship Graf Zeppelin; Paul W. Litchfield, president of the Goodyear Tire and Rubber Company and of the Goodyear-Zeppelin Corporation, and others prominent in the airship world.

Dr Eckener was feted by the city of Cleveland in addition to being present at the meet. He later flew away from the airport to Akron in company with Goodyear officials in a representative of his chosen medium of air transportation, the Goodyear Defender Dr Eckener embarked in front of the judges stand

On account of the number of races which had been postponed from previous days because of lack of time, the events for Labor Day were started at 8:05 a.m. instead of at noon as originally planned Difficulty was experienced with the work of handicapping the contestants and delays ensued, making it necessary later in the afternoon to arrange for an extension of the races through one more day

The feature of the day's racing was the free-for-all in which seven planes, including one representative each from the Army and Navy, were flown Out of this race came the sensational victory of the so-called Travel Air Mystery plane, the wire-braced low wing monoplane powered with a supercharged Whirlwind Nine and fitted with an N.A.C.A. cowling and a very completely stream-lined landing gear. The wing is covered with plywood and highly polished, and with the blunt nose of the ring cowling and the bright red fuselage and tail surfaces the machine made a very striking appearance.

An average speed of 194 9 m p h for the 50 mi course was turned in by the little speedster It was achieved in spite of the accidental cutting of a pylon, which necessitated turning back to round the mark correctly This is the highest speed ever achieved in the United States by a commercial plane, and far exceeded the best times made by any machine, either commercial or military, throughout the current races ft is also, the first time in the history of American air racing that a commercial plane has defeated both Army and Navy contestants in a free-for-all

Douglas Davis of Atlanta, Ga., was the pilot. His elapsed time was 14 min 05 9 sec. On his fastest lap he was clocked at 208 69 m p h Second place went to Lieut R G Breene of the Army, flying a Curtiss P-3-A with Wasp engine, also with the N.A.C.A. or venturi-cowling His elapse time was 14 min 42 4 sec and speed 186 84 m p h. Rosco Turner finished third in a Wasp powered Vega in the elapsed time of 16 min 48 7 sec—a speed of 163 44 m p h, Lt Comdr J J Clark, flying a Navy Curtiss Hawk with Prestone cooled D-12 engine, was fourth

The piloting was watched with special attention in the free-for-all, since it was to be presumed that the most skilled and experienced of racing pilots available would have received that assignment In the first three laps Lieutenant Breene had passed three competitors and Davis had passed two, and it became apparent, as indeed it had been considerably earlier, that the race lay between those two Both of them flew comparatively high by the standard of previous races, varying between 200 and 350 ft Their turns were a little superior to those of any of their competitors, although the general standard was very high, and Lieutenant Clark's maneuvering of the Navy machine and that of the Simplex monoplane were also notably good The time around the turns was running from 3.5 to 4 sec for the two fastest machines, but the high wing loading of these planes of course made it hardly possible to throw them around as quickly as could be done with, for example, Miss O'Donnell's Waco The competing pilots' prevailing idea of the proper angle of bank was about 75 degrees, with the Simplex banking a little more steeply than that, and Roscoe Turner's Lockheed a little less Both of those pilots tended to climb distinctly on their turns, while Lieutenant Breene dived about 60 ft on each one and Douglas Davis went around without appreciable change of altitude

ANOTHER HIGH LIGHT of Monday's racing was the experimental race for civilians in which four machines participated It was limited to machines having a total engine displacement of between 510 and 800 cu in H S Mylnes won in a Simplex high wing monoplane with Warner Scarab engine, in an elapsed time of 10 min 12 2 sec and an average speed of 147 01 m p h around the 25-mile course

C E Clark in a Travel Air low wing monoplane with 6 cyl Chevrolet engine came second with an elapsed time of 13 min 13 8 sec and an average speed of 113 38 m p h. In third place was C J Faulkner in a Heath Baby Bullet powered with a Bristol Cherub His time was 14 min 16 8 sec and his average speed 105 4 m p h The fourth plane, an N B 3 with Armstrong Siddeley Genet, was flown by H A Speer

The definition of "experimental" was a little uncertain, and if all the machines that participated in the race were entitled to entry in that class the same privilege could have been claimed for several others, both civil and military, of even higher speed.

Waldo Waterman and William S Brock, flying tri-engined Bachs, walked away with the multi-engined race, defeating M Gistin in a Fokker by a wide margin Waterman completed the course in 20 min 8 6 sec at an aversge speed of 136 4 m p h. Brock was close behind with an average speed of 134.46 m p h Gistin took 22 min 20 4 sec and was clocked at 123 m p h

Gladys O'Donnell won the Cleveland-Pittsburgh race for women, flying the 100 miles in 46 min 5 sec Louise McPhetridge Thaden finished second with a time of 50 min 4 sec and Ruth Nichols, the third contestant arrived about 25 min later.

Close-up of airplane airship attachment

WHILE THE RACES THEMSELVES were of considerable interest to both the layman spectators and the members of the industry, there were many non-racing events that will long be remembered Perhaps the major ones were the stunt exhibitions, because of their spectacular nature and thrill appeal. Every day Colonel Lindbergh led his two High Hat friends into the air in Navy pursuit planes and put on a show that included wingtip formations, squirrel cage loops, inverted flying, and other maneuvers not required by the Department of Commerce The Army, Navy, and Marine Corps did their stuff every day as a means of showing tax payers what the pilots could do with the articles purchased with their money

Although all were very brilliant, and special mention has been made of some of the special exhibitions given by the Pursuit Group, the first award for proficiency in taking up and maintaining formations must go to the Navy's Fighting Squadron No 1, "The High Hats" On several days toward the end of the week one division of nine planes maneuvered with the members of each section of three tied together by ribbons at wing tips, a stunt made famous some years ago by Lieutenants Doolittle and Brookley and the late Lieutenant Pearson and Captain Skeel of the Army Air Corps The nine Navy fighters not only took off and maintained their formation and turned in formation without breaking their 40-ft ribbons, but actually changed from Vee to echelon and back again On one occasion, when conditions were right, the whole division landed without having broken a single one of the six connecting ties

The marines' most spectacular contribution was a dual squirrel-cage, two sections of three performing the maneuver side by side and only a couple of hundred feet part, the members of each section chasing each other around and around a string of loops. Civilian stunt teams representing the Waco, Laird, and Travel Air Companies did their daily dozen also Many of the stunters, both military and civilian, stayed too close to the grandstands at times A bigger thrill goes with stunts performed over one's head, but if anything should go wrong it would be less tragic for one pilot and one airplane to suffer, especially as the parachute gives the pilot a chance, than to involve fifty or sixty innocent bystanders. As a matter of fact there were several cases when the stunters pulled out with almost nothing to spare

Each day the program was opened with dead stick landing contests, and these events, held directly in front of the stands, met with the hearty approval of the crowd

Each day also saw various gentlemen stepping off into space pulling rip cords, and endeavering to land in a circle marked out on the field Sometimes they missed the field altogether, and that added to the thrill of the affair.

As another frequent side attraction on the program four Goodyear blimps floated around the field, in formation and otherwise The Autogyro was taken aloft several times by its inventor Senor de la Cierva. These flights attracted considerable attention, as the Cleveland appearances were the first public demonstrations of the autogiro in this country

ANOTHER SIDE SHOW was furnished by various glider flights It had originally been planned to make glider flights a part of each day's program, but due to the fullness of the program and the delay in getting some of the events run off the gliders were continually shoved aside, and as a result did not get the attention they merited. Incidentally there is much room for improvement in running off the events at a national air race meet While the rules state that all entries must be in by six o'clock on the previous evening, there were many cases of last-minute entries getting into a race. In fact sometimes even the officials themselves did not know all of the entries, much less the type of machines they were flying, and on one occasion the announcer broadcast a pathetic appeal for someone in the audience to come down and tell him who was who around the course

By actual count made one morning of an average day during the week there were a total of 417 planes of various types on the ground inside the airport fence Although this total includes the 96 military craft, it does not take in the planes in the air over the field at the time, or the one Autogyro, three or four craft parked just outside the airport boundaries, nor 8 or 10 gliders that contributed to the entertainment during the week Classified by type the count revealed that 169 of the total were open cockpit biplanes, 120 were cabin monoplanes, 17 were open monoplanes, and 6 were cabin biplanes, making a total of 312 planes of the strictly land going type To be added to this are nine amphibions, four of which were Army or Navy owned and five commercial Out of the grand total, only 15 of the planes were of the tri-engined type Twelve, including the seven Keystone bombers from Langley Field, were twin engined.

THE S. A. E. DISCUSSION OF Standards AND Aircraft Lighting

By EDWARD P. WARNER

IN ACCORDANCE with the practice at all of its sessions for the last two years, the S A E aeronautical meeting opened with a discussion of the Society's standardization work in the aeronautical field The only fixed element on the program was a report by W M Johnson of Nela Park upon the studies that have been undertaken by the aircraft lighting subdivision of the S A E Standards Committee Opening his remarks with an estimate that there were already about six hundred commercial planes equipped with landing lights in the United States Mr Johnson explained that the aircraft lighting committee had undertaken to direct a co-operative research in which a number of aircraft operators and manufacturers of equipment had volunteered to participate Operators who are taking part and who have promised to render reports upon their experience with the test equipment prepared under the direction of the committee are the Pitcairn, National Air Transport, Boeing, and Stout Lines and the Army Air Corps

While the tests have not yet been carried far enough for a detailed report, the equipment that is to be used was displayed Special lamps have been made up to provide for easy control of the inclination of the beam and for simple variation, by a change of the lens in front of the light, of the spread of the beam both in the horizontal and vertical plane In the test by the air line operators, the planes will be equipped with one fixed light of the ordinary type and with one of which the direction can be controlled by the pilot the beam being tilted anywhere between the horizontal and the vertical The spread will be varied from two degrees a very sharply concentrated beam to forty degrees a well-diffused one Reports will be rendered as results are obtained and it is hoped that standardization of the power and the other characteristics of landing lights at figures that will be satisfactory to all pilots will become possible through the experience gained in the test

L C Porter discussed the report at some length, with special reference to the work of an aircraft lighting committee of the Illuminating Engineering Society of which F C Hingsburg of the Department of Commerce is the chairman The I E S committee is at work especially on the theoretical aspects of the problem of illumination both for the airplane and for ground lighting Among the other topics that it is studying are the standardization of color of lighting for particular purposes, the determination of the best period of flash for airway beacons the relative efficiency of concentrated and distributed lights for piercing fog a selection of the best coloring and type for boundary lights so that they may readily be distinguished from highway or city lighting and the ideal grouping of flood lights around a field Mr Porter spoke especially of the desirability of working for international standardization on these points The chairman also emphasized the international aspects of the work, with special reference to the importance of securing agreement with Canada which will facilitate international operation across our northern boundary The Canadian Government, in turn, naturally wishes to keep its practices in harmony with those of other portions of the British Empire and the quest for a general international standard therefore becomes necessary

F G Diffin urged the importance of immediate attention to the standardization of airport lighting with special reference to the means of indicating the extent of the runways and the direction of the wind, and to the provision of means for signalling to the pilots in flight over the airport without having to use radio

Navigating Instrument Mountings

AMONG the general standardization topics taken up for consideration, the first was the mounting of instruments A communication from the chief engineer of the Consolidated Instrument Company had suggested mounting in all cases so that the instrument pointers would all lie in the same direction for normal flight conditions and proposed that the figures on the dials should be arranged regularly as on a watch dial, so that the instrument could be turned to any angle for mounting without turning all of the figures upside down or making them appear unsymmetrical Mr Peace of the Pioneer Instrument Company expressed the belief that instrument manufacturers would be willing to put the figures anywhere on the instrument and to make them read right side up with the instrument at any angle desired at very little additional cost to the manufacturer of an airplane in quantitative production Wesley L Smith of National Air Transport who had declined at a similar meeting a year ago to express any definite judgment on the best size for instrument dials, was prepared on this occasion to express his conclusions in favor of larger dials. In spite of the recent movement backed by the Army and Navy for material decrease in size as a means to more compact mounting Mr Smith felt that the strain on the pilot from peering at dials less than three inches in diameter would be excessive in a long flight, and that as a means to enabling pilots to fly more hours per day with comfort the dials should be enlarged. He also expressed himself as strongly in favor at present of a cross-shaped mounting arrangement for instruments with all the pointers standing horizontally on the group of instruments on the horizontal line, vertically on those in the vertical line, under normal flight conditions and all the instruments in a row tending to deviate in the same direction on deviation from normal flight That arrangement has already been employed on the instrument boards of certain machines planned for especially long flights and long periods of flying

Turning to wheels and tires, the meeting heard and approved a recommendation from Mr. B J. Lemon of the U S Rubber Company, chairman of the subdivision on wheels and their parts, that there should be a minor modification in the ten-inch and twelve-inch rims to secure easier mounting of tires Mr John R Cautley of the Bendix Brake Company was asked to comment on the possibilities of international standardization of tires and wheels Mr Cautley who had recently returned from Europe, indicated that the problem of international agreement was one of great difficulty, although the advantages resulting especially to operators in countries where both American and European airplanes are used in quantity, would be so great that no possibility of reaching a basis of agreement should be neglected He pointed out that the British tire industry was largely organized on the basis of millimeter sizes for its product, but that some of the tires of metric dimensions were so nearly identical with tires of inch dimension used in this country that interchangeability might be possible He called the attention of the meeting further to the fact that one British tire manufacturer lists 72 different sizes and forms of airplane wheels and 29 different sizes of tires as stock, and that the drop-center rim and straight-side tire have made no such headway in Great Britain as in this country, British airplanes still being designed for clincher tires in many instances

Aircraft Hardware

A COMMUNICATION from Mr. Gwinn of the Consolidated Aircraft Company protested against the present standard for tie-rods as permitting excessive bearing pressures for carbon steel, with frequent elongation of the holes in the lugs as a result B C Boulton of the Keystone company agreed that the present sizes were too light, especially when aluminum alloy lugs were used J. M. Johnson of Wright Field conceded that special modifications were probably necessary to meet the use of aluminum alloys in fittings but said that he had encountered elongation of the holes in carbon steel fittings only when the number was one subject to reversing loads, never when it was a wire in pure tension He suggested that there should be further study of the loading conditions in these members especially when a standard terminal was used in attaching a strut to a fitting

Some of the equipment prepared for use in the co operative lighting tests The light on the left is the special tiltable one

Mr. Gwinn had further protested against the present process of making aircraft bolts only in lengths spaced one eighth inch apart He found it often to require packing out with washers to an undesirable extent in order that the bolt thread might not be placed in bearing and that the nuts might secure a sufficient grip on the bolt Mr. Boulton again concurred, and J. F Hardecker, Jr. who represented the Naval Aircraft Factory at the meeting, declared himself personally agreeable to reducing the spacing of lengths to one-sixteenth inch intervals, doubling the number of standard bolt lengths in each diameter Mr Hardecker further spoke of the importance of standardizing engine hardware as well as that of the airplane itself The Army and Navy, he said, are working upon the subject now, and are eager for the co operation of the Society of Automotive Engineers and of the whole commercial engine industry

Mr. F W Caldwell, chief engineer of the Standard Steel Propeller Company, brought the discussion to a close by urging that a standard should be adopted for a taper propeller shaft end smaller than the standard OX-5 shaft which stands at the foot of the present list of S A E standards in that held He had found that many low-powered engines were being designed with crankshafts of too small a diameter to permit the use of the OX-5, or S A E No 1 shaft end and that a large number of manufacturers were at present proceeding each with its own design, with danger of limitless conflict and increase of expense for special propeller hubs.

COMMERCIAL AVIATION AND *Engineering*

By EDWARD P. WARNER

An Evening of Discussion at Cleveland on Merchandising and Transportation Economics

AT THE Commercial Aviation session of the S.A.E., held on Tuesday evening as an appendage to the aeronautical dinner at which Hon. David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, was the principal speaker, an outstanding feature was the first address delivered in the United States by Señor Juan de la Cierva, originator of the Autogiro. Señor La Cierva spoke only briefly, but explained how he had conceived the idea of the Autogiro in 1919 after extended experience as a designer and constructor of airplanes, and told something of the evolution of the type. He described briefly the changes made in producing his present machine, which was on exhibition at the airport during the week, and especially the biplane arrangement of tail surfaces which permits the elevator to act as a deflector, throwing the slip-stream up against the overhead rotor and assisting in getting it under way before motion along the ground is started. The speaker protested against the practice of judging the Autogiro, still in a very early stage of evolution and resting almost entirely on his own work alone, in competition with the most efficient of present-day airplanes. He predicted that the ultimate maximum speed of the type would be at least equal to that of the airplane for similar service, and that it would be combined with a zero landing speed. He claimed also that it had been shown by experience, both with former airplane pilots and with other individuals with very little previous flying in their record, that training for the operation of the Autogiro would be much simpler than learning to fly a plane of standard type.

The three remaining papers of the evening were devoted to specifically commercial and economic subjects. Russell L. Putnam, lately vice president of the A. W. Shaw Company and in charge of the experiments made two years ago in the intensive operation of a plane for *The Magazine of Business*, spoke on "The Selling of Airplanes to Business Houses."

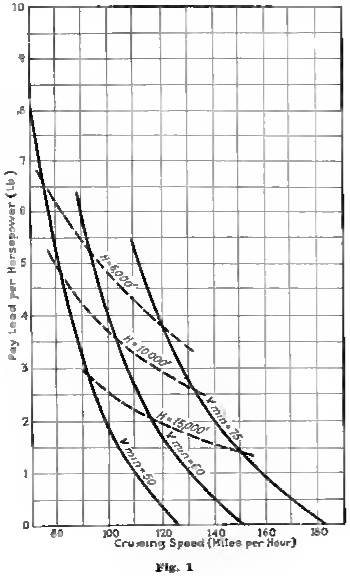


Fig. 1

Airplane Merchandising Problems

MR. PUTNAM frankly proclaimed himself a layman looking at the aircraft industry from the outside. He expressed himself as much impressed with the necessity for a closer study of the real nature of the market for airplanes and of the sales resistance factors encountered, and for a more intensive selling effort on the part of the industry as a whole.

Stressing the outstanding significance of safety and the need of overcoming fear if sales were to be expanded, he urged that the entire aviation industry cooperate in telling the public of the safety and sanity of ordinary flying and in overcoming the effect of sensational occurrences which naturally have more news value than any number of flights carried through as a matter of routine and without misadventure. "People must learn to feel," Mr. Putnam said, "that they can climb into their own plane or into a transport liner with the same assurance of safe arrival at destination as in the case of trains, steamboats or automobiles. A tremendous task, this, and one which has not yet been adequately attempted."

Dealing with the importance of studying and classifying the market, the author of the paper grouped the uses of airplanes in business under six heads:

(1) Publicity or advertising.

(2) Customer and prospect cultivation (or entertainment).

(3) Building employee and dealer enthusiasm, loyalty and morale.

(4) Transportation of (a) executives, (b) salesmen.

(5) Transportation of products or mail.

(6) Protection of lowered inventories.

He recognized, however, that no general classification would fit every case and that it was indispensible that airplane manufacturers should select particular prospective customers and make a detailed study of their individual business problems to suggest how the airplane could be fitted into their requirements. It may be remarked that implied evidence of the correctness of Mr. Putnam's views on the importance of giving individual service to the individual customer and helping him in finding out what he can do with an airplane is furnished by the fact that a handful of airplane manufacturers who have given special attention to the matter have secured the vast majority of the patronage of business houses that have bought planes for their own use. One or two in particular have been so successful in developing this market that it has already absorbed a large proportion of their total output.

Table I

Cruising Speed (m.p.h.) Min Speed =	Pay Load per Horsepower (Lb.) 50	60	75	Ceiling (Ft.) 50	60	75
80	5 5			8,100		
100	1 9	4 1		18,300	8,300	
120	0 3	1 7	3 9	22,900	16 500	5,600
140		0 5	2 0		23 000	12,500

The author felt that the aircraft industry had suffered in its way of regarding its market from having experienced too little sales resistance over a certain period. "In recent years," he put it, "there has been no need of selling. The principal activities of the business have been those of making airplanes and of financing. But the day of easy business is well nigh over. Manufacturers increased their production capacity manyfold. Yet little has been done to develop a market that will absorb the ever-increasing number of aircraft." Whether the aeronautical industry agrees with that indictment of its selling efforts or not, it is of interest as the conclusion reached by a business man who has no connection with the industry, but who has given special attention to observing its development.

Mr. Putnam went on to seek for statistical support for his general conclusions about the lack of selling effort in the aviation industry. He found it very difficult to secure, but what material was to be had pointed to an expenditure of from ten to twenty per cent of gross sales on selling costs by the average airplane company, while other industries having points of similarity with airplane manufacture expended about twice as much. "Past and present experience," the paper concluded, "has shown that business men can and will use the airplane as we educate them to its safety and usefulness. How far it will be developed is entirely up to the manufacturers of airplanes.

With the heavy competition that faces us in the immediate future, can any manufacturer afford not to develop the strongest sales organization possible and intensively cultivate every market for sales? The heavy financing of airplane manufacturers during recent years has eliminated the opportunity for shoestring operations. Too many manufacturers are going after the business. Those who will survive will be the ones who invest wisely in sales cultivation and in rapid development of sales, rather than those who wait for a slow development."

Captain Emory Scott Land, (C. C.) U. S. N., chairman of the meeting

In his verbal presentation of an abbreviated version of his paper, Mr. Putnam supplemented its contents with the definite statement that cost should be subordinated as a factor and that purchasers should be persuaded to relegate it to the background. Air transportation and the use of airplanes, in his opinion, should be sold on the basis of performance, not of cost.

The same thought was very much present in the remarks of William B. Stout of the Ford Motor Company, who followed Mr. Putnam. The public, he felt, wanted performance and the consideration of cost was a minor one. Mr. Stout drew citations from his own experience as a manufacturer and operator, and especially from the large extent to which the demand for three-engined airplanes had switched itself over from a model with three 200-hp. engines to another of about the same size, but much more expensive and carrying twice the power with a proportionately higher performance.

The final paper of the evening was delivered by the present writer, who is accordingly placed under the embarrassing necessity of reviewing his own contribution to the meeting. The paper's object was the determination of the actual increase in cost of air transport with increasing speed, data much needed in determining the best cruising speed for a given operation.

Table II.

Cruising Speed, m.p.h.	Cost per Passenger Mile, Based on a Load Factor of 3 (Cents) Min Speed = 50	60	75
70	11 91		
80	12 45		
90	14 66	11 76	
100	15 75	13 40	
120	39 00	15 12	12 03
140		23 21	13 59
160			17 72

In starting the calculations it was assumed that an airplane will cruise at 85 per cent of its maximum speed, that the structural weight of the machine is one-third of the total weight carried in flight, and that the power plant, including its accessories, weighs 2.5 lb. per hp. The

maximum and minimum speeds were determined by the formulas

$$V_{max} = 127\ (P/S)^{0.33}$$

$$V_{min} = 16.5\sqrt{\frac{W}{S}}$$

which although far from infallible, have been found to give a satisfactory approximation of the average results obtained with good modern designs. W, S, and P respectively, are the gross weight, wing area in square feet, and horsepower. It was further assumed that two-thirds of the load remaining after the structure of the power plant and the fuel are taken out can be considered as pay load, the other third going for the crew, navigating instruments and radio, and the furnishings of the cabin. Calculations were then made for the pay load per horsepower that can be carried, and the ceiling that can be expected in planes of good present-day design for three different minimum speeds. The results are tabulated below, and are also plotted in Fig. 1, where ceiling lines have been drawn in dotted. The paper argued in favor of a ceiling of at least 10 000 ft. as the minimum of safety for commercial airplanes since a machine without enough reserve of power to reach that height would be unable to fly at even a couple of thousand feet above sea level with one out of three engines dead. If it is to be necessary to operate over mountainous country, the required ceiling should be increased to at least 7 000 ft. above the highest altitudes that have to be crossed.

The suggestion has frequently been made, although less often now than a few years ago, that a commercial airplane ought to carry at least five pounds of pay load per horsepower. Fig. 1 shows that, so long as the performance formulas used in the calculations remain valid, load

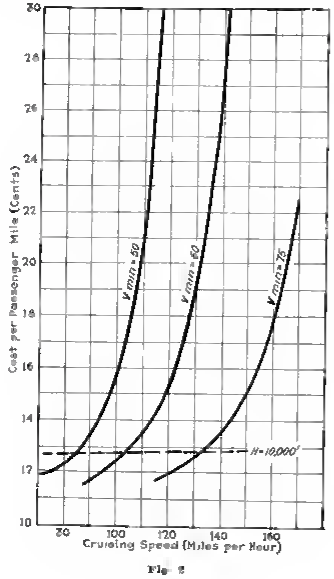


Fig. 2

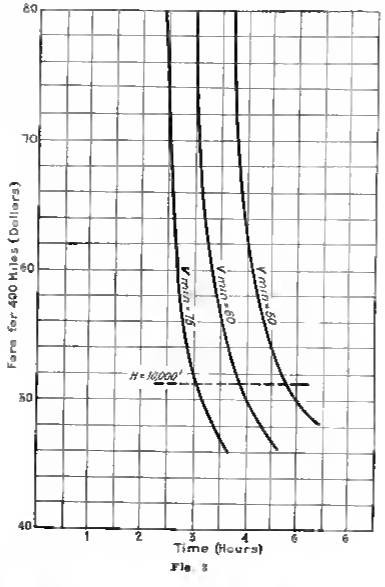


Fig. 3

capacity can only be combined with a ceiling and reserve of power adequate for safety by designing for a minimum speed of about 50 m.p.h. and a cruising speed of about 80.

Turning to the economic aspect, the paper included the formulas

$$\text{Engine} = 14\ P$$
$$\text{Airplane} = 8\ P + 1.2\ W$$

for the cost of the engine, including its accessories, and the cost of the airplane, including the instruments but not the power plant, respectively. P in the formulas is the total horsepower. W is the gross weight carried. These figures were indicated to check reasonably with the average of present prices. In figuring cost those elements which would be independent of the speed of the airplane were entirely neglected. There remained for consideration fuel and oil, maintenance, depreciation, insurance and interest on the original investment. Insurance was reckoned as 16 per cent, depreciation on the basis of a life of four years of continuous flying for the airplane and two and a half for the engine, and interest at eight per cent. Maintenance was taken at a figure corresponding approximately to $1.00 per hour of flight on a 350 hp. engine, and at just about ½ of the value of the airplane structure each year, assuming 800 hours of flying per year. Fuel and oil were figured at average present price levels. It was then easy to figure the variable costs of operation in terms of cents per passenger mile. In Table II, reproduced from the paper, that has been done with the assumption of an average passenger load of two-thirds capacity, and with an allowance for overhead and other fixed expenses not included in the calculations of nine cents per passenger mile, so bringing the total cost to about the level of present fares. The

same data are plotted in Fig. 2, where the line corresponding to a 10 000 ft. ceiling is again included.

The paper called attention to the rather remarkable fact that for a given ceiling and so for a given proportion of reserve of power a minimum operating cost per passenger mile is exactly the same for all minimum speeds and for all cruising speeds, provided the proper relation between minimum speed and cruising speed is maintained. The latter must be about 1.75 times the former for the most economical operation compatible with a safe reserve for emergencies against loss of power or the necessity of maneuvers.

The writer's next step was to figure the fare for a 400-mile trip under various conditions, and plot it against time. The result reproduced in the paper is shown in Fig. 3. From that in turn it was possible to calculate the cost per hour saved by increasing speed, and the results appear in Fig. 4. Thus if a plane with a minimum speed of 60 m.p.h. and a cruising speed of 110 is said to be unsatisfactorily slow, and if it is desired that the speed be increased, it must be recognized that the first saving in time will have to be purchased at the rate of about $16 per hour, a rate which will increase steadily as the speed increases.

By increasing the minimum speed or landing speed however, cruising speed can be increased without additional cost. It was considered that if higher cruising speeds, such as are often predicted, are to be realized in practice it must be done by

(1) Increasing the aerodynamic efficiency of the design so that the performance formulas used herein will no longer apply,

(2) Increasing the structural efficiency, either of airplane or engine, to reduce weights below present practical limits,

(3) Reducing such items of expense as insurance and depreciation,

(4) Using a variable-lift mechanism of some type for the wings, or

(5) Raising the landing speed.

The fifth, third, first and second of these possibilities were indicated to be of that order of promise for the near future. The limitation upon the increase in landing speed is one of safety, especially important when forced landing has been reckoned as a possibility. "In no ordinary case," the paper terminated, "does seeking to operate at a cruising speed of more than 1.8 times the minimum flight speed appear economically advisable at present. To increase cruising speed beyond the present level [without radical innovations in design or striking increases in efficiency] we must therefore increase landing speed, and the possibility of taking that desirable step depends upon the use of engines, engine combinations, and maintenance methods that will provide a virtually actual safeguard against emergency forced landings and upon the provision of airports large enough and smooth enough to permit of landing and taking-off at very high speeds without undue difficulty or danger. These are the keys of the problem."

The discussion was confined to remarks by Capt. E. S. Land, chairman of the meeting, who took exception to the advocacy of higher landing speeds, and urged that it was desirable rather to work for lowering them in the interest of safety. The writer replied that he was in hearty accord with that view, as it affected airplanes likely to be flown by pilots of limited skill, but that he considered that the spread of permissible landing speed should be wider than at present. Instead of seeking to keep landing speeds around the region of 50-60 m.p.h. in every case, they might well be cut to 40 m.p.h., with a wing loading of 6 lb. per sq. ft. or less, for machines for the private owner and allowed to rise to 70 or even more for multi-engined transport machines operating between metropolitan airports.

A preliminary feature of the dinner, before the technical session began, was the award of the Manly Memorial Medal to Samuel D. Heron. The Manly Medal was founded by the Society of Automotive Engineers in memory of Charles Matthews Manly, former

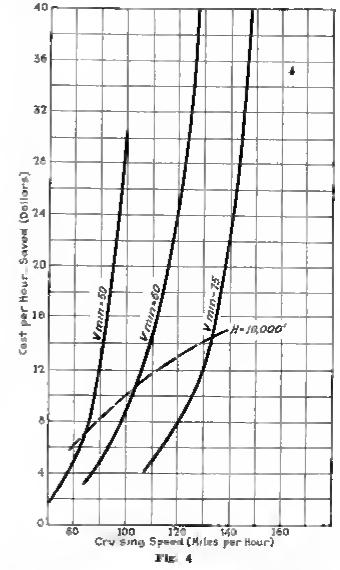


Fig. 4

president of the Society, engineer in charge of the construction and test of the Langley flying machine of thirty years ago, and especially noted for his design of the engine in the Langley plane, which produced approximately 50 hp. on a weight of 120 lb. at a time when most established engine designers would not have been prepared to reach one-fifth of that power weight ratio. It is awarded annually for the best paper on an aeronautical power plant subject presented before the Society during the year, and went to Mr. Heron, formerly of the Royal Aircraft Establishment and now of Wright Field, for his paper on non-radial air-cooled engines, delivered at the Chicago meeting last December. In making the address of presentation at the dinner, Charles L. Lawrance, one of the three judges who selected the winning paper, paid tribute to C. M. Manly's contributions to the art of aircraft engine design, and spoke with warm appreciation of the value of the work on air-cooled cylinders done by Mr. Heron at Wright Field a number of years ago, in the pioneer days of American radial engine development.

GENERAL NEWS

Circum-Avigation of Globe Completed by Graf Zeppelin

21 Days 7 Hr. is New Round-World Record

As AVIATION *goes to press, word is received that the Graf Zeppelin was landed at Friedrichshafen Sept 4 at 2 51 a m, N Y daylight time, completing the Atlantic crossing in 67 hr 33 min A record of 20 days, 15 hr 17 min was made around the world from Friedrichshafen to Friedrichshafen, lowering her record from Lakehurst to Lakehurst by about 17 hr*

LAKEHURST (N J)—Completing the first circum-avigation of the world by airship, the "Graf Zeppelin" was landed here at 8 13 a.m. Aug. 29, exactly 21 days, 7 hr 34 min after taking off on the historic voyage. Once before the globe had been circled by air, but the American Army aviators who accomplished the feat in 1924 spent six months doing it because of their many stopovers. Even their actual flying time 363 hr) was nearly one-third longer than the 263 hr 43 mm flying time required by the dirigible, because of the longer route they followed. The Graf Zeppelin's average speed was put at 39.09 m.p.h., and its average air speed, 75.84 m p h. The total distance covered was approximately 20 000 mi

Three intermediate stops were made at Friedrichshafen Tokio and Los Angeles. The longest leg, from Friedrichshafen to Tokio, was about 6 800 mi, and was covered in approximately 101 hr. On each of the four jumps, the time actually required to cover the distance was less than the estimate made beforehand, while the final arrival at the end of the trip was five days ahead of the date originally set. In consequence, the previous record of 23 days, 15 hr 21 min for circling the world, established last year by John Henry Mears and the late Captain C. B. D. Collyer traveling in fast steamships and their own airplane, was reduced by more than two days. It was thought that the seven members of the crew who came across the United States via Transcontinental Air Transport might arrive here before the Zeppelin thus gaining the record for themselves, but they failed to do so by four hours

Piloted Flying Over Pacific

Competent weather reports furnished by the governments of the various countries traversed helped to make the trip of the giant dirigible successful, but as a matter of fact the airship showed a remarkable ability to proceed in spite of conditions. Serious storms encountered both over the Pacific and in western United States were "ridden out" without difficulty and even without any great anxiety on the part of passengers or crew. About 40 of the 68 hr. required for the crossing of the Pacific were spent in blind flying through heavy fog, yet the airship kept its course perfectly. The original plan of selecting the route for each leg of the trip from weather reports received just before the takeoff did not result in any very large deviation from the natural airline course between the scheduled stops.

The trip was marred by only two mishaps. At Tokio, struts of a rear gondola were damaged while the dirigible was being taken out of a hangar which provided only 18 m. clearance, and a delay of about 24 hr. resulted. And as the airship left Los Angeles, the rudder fouled one of the wires of an electric power line and was slightly damaged though not sufficiently to stop the completion of the trip. The Zeppelin had a narrow escape on this occasion however, as contact between the power line and the metal hull might have resulted in an explosion of the hydrogen gas in the envelope.

Many Use Mails

While the trip was not undertaken as a commercial venture, considerable revenue was derived from the $9 000 fare for each passenger who made the complete journey, and from the mail carried. Many people paid the $3 60 to send letters completely around the world, in order to secure the special stamps used and to have the souvenirs. Other charges varied from $.60 for letters between Los Angeles and Lakehurst to $1 80 from Los Angeles to Friedrichshafen. A number of commercial firms also sent light merchandise via the airship as an advertising feature. In addition to twenty passengers, the Graf Zeppelin can carry 3 300 lb of mail and freight, together with full supplies of fuel. The Graf Zeppelin was handled at Tokio by a special ground crew assembled by Japanese Naval authorities, and at Los Angeles and here by crews under the direction of the Navy Department. A Navy mooring mast was used at Los Angeles and a Navy hangar here.

Complete data on the amount of fuel consumed, the total cost of the trip and other points of special commercial interest are not yet available. As previously reported, the fuels used were blau gas" taken on at Friedrichshafen, and ethane and "Pyrofax" supplied at Lakehurst Los Angeles and Tokio by Union Carbide Company. The Graf Zeppelin has used "Veedol" oil exclusively on all of her voyages, and also carried a reserve supply of gasoline furnished by Tidewater Oil Company.

The airship remained here only long enough to refuel, starting on for Friedrichshafen at 8 19 a.m. Sept 2, under the command of Capt Ernest A Lehmann. Dr Eckener remained in this country on business. The United States Navy Department accepted Dr Eckener's invitation to send three naval officers aboard the Zeppelin as passengers to Friedrichshafen. They are: Lieut Comdr Herbert W Wiley, commanding officer of the "Los Angeles" Lieut Comdr J M Shoemaker and Lieut Roland G Mayer

Stearman Will Build Hamilton Metal Planes

WICHITA (KAN.)—Stearman Aircraft Company will soon absorb the Hamilton Metalplane Company, division of Boeing Aircraft Company. The Hamilton factory in Milwaukee will discontinue operation and all equipment and a large part of the personnel will be moved to the Stearman plant here, where planes of the Hamilton all-metal type will continue to be made. Both companies are divisions of United Aircraft & Transport Corporation.

The Stearman sales organization will handle the distribution of Hamilton planes, and the Stearman factory will supply parts and service. It is also possible that a factory for the manufacture of Hamilton planes may be established in Italy to supply the Transatlantica Line which has one now in operation between Venice and Rome.

Announcement of the change was made during the National Air Races at Cleveland by George S. Wheat, vice-president of United Aircraft, and Mr. Stearman who took the opportunity of expressing the interest of the Stearman company in metal aircraft development.

Among transport operators in the United States who now use Hamilton planes are Northwest Airways, Universal Air Lines, and Braniff Air Lines.

Raise Insurance Commissions

NEW YORK (N. Y.)—According to Eastern Underwriters, commissions on aviation business have been increased by the Independence Companies. General agents now receive 20 per cent on fire risks, 25 per cent on liability, and 17½ per cent on compensation. Brokerage is 7½ per cent less than these respective rates.

U. S. Leads in Civil Aircraft Development

WASHINGTON (D. C.)—In the number of civil aircraft in operation, and number of miles flown in regular service, the United States led the world for 1928. Germany was ahead in number of passengers carried on established air lines and in total mileage of air lines, with the United States second. Other figures made public by the aeronautics trade division of the Department of Commerce showed the United States first in pounds of mail carried, but fourth in pounds of baggage and goods.

Specific figures showing the leading countries in the various commercial uses of airplanes are given below. Column A shows the total number of civil aircraft; column B, miles of airlines in operation; column C, passengers carried; column D, mail and baggage carried (pounds).

	A	B
United States	6 320	16,667
Germany	535	18,540
Great Britain	353	2 522

	C	D
United States	40 713	5,900 040
Germany	115,000	3,412,680
Great Britain	10 035	2,318,544

Accurate figures suitable for comparison are not available for France, Italy Canada or Australia, but figures given indicate that in general commercial aircraft development they rank about even with or a little ahead of Great Britain. For its size, Netherlands shows remarkable development with 17,165 passengers and 1,645,651 lb of mail and baggage carried over regular air lines.

New Barber & Baldwin Account

NEW YORK (N. Y.)—The Fire Association fleet of insurance companies, comprising the Fire Association of Philadelphia, the Reliance Insurance Company, the Victory Insurance Company, and the Constitution Indemnity have appointed Barber & Baldwin, Inc., their exclusive agent for underwriting aviation insurance. While a year ago the surplus to policy holders of the companies represented by Barber & Baldwin amounted to $3 803 702, the firm represents today (excluding the Independence Companies of Philadelphia for whom they discontinue writing on Sept. 30) companies with a surplus to policy holders of $42 932 288.

Helium Tank Orders to Smith

CHICAGO (ILL.)—A. O. Smith Corporation this city has received a contract from Goodyear-Zeppelin Corporation for 96 helium gas storage tanks having a minimum total capacity of 1,000,000 cu.ft. of helium gas. These tanks are to be installed at the Akron field of the company. The Smith concern also has received a contract from the Bureau of Aeronautics, Navy Department, for 50 similar tanks having a total capacity of 320,000 cu ft. for the Lakehurst field.

Hawley Balloon Race Referee

ST. LOUIS (MO.)—Alan R. Hawley, New York sportsman, has been appointed referee for the Gordon Bennett International Balloon Race to be held here Sept. 8. Hawley established a record in a Gordon Bennett race from St. Louis in 1910 when he traveled 1,173 mi. At that time he was lost for eight days in northern Quebec and finally brought his balloon down on the crest of a 1,500 ft. mountain, fifty miles from the nearest trading post.

Larger Production Of Engines Reported

NEW YORK (N. Y.)—Reports from fifteen American engine manufacturers indicate an increase of 78 per cent in the production of airplane engines in the first six months of 1929 over the corresponding period in 1928, according to figures made public by the Aeronautical Chamber of Commerce. Of the 3,826 engines produced up to June 30, 3,275 were absorbed by the commercial market. The total value, $10,923,374.30, represents an increase of only twenty per cent over the value of commercial engines produced in the first six months of 1928, indicating a decided increase in the market for engines of medium price.

Three manufacturers produced 551 engines for military planes, with a total value of $3,426,001.15.

Commercial engines of 300 hp. or more still dominate the market, with a total of 1,242 as against 2,033 in all other categories. The classification from 100 150 hp. is next with 713, and the classification from 50-100 hp. is third with 509. Only 43 engines of less than 50 hp. were sold.

Air Corps Cut Not Expected

WASHINGTON (D. C.) — Whatever Army reduction program may be decided on, it is not expected that the effects of the pruning knife will be felt by the Air Corps to any considerable extent. Congress by directing a five year expansion program to be carried out by the Corps has rendered it improbable that any curtailment of activities will be attempted in this branch of the service. Apparently, the War Department intends to take advantage of the retrenchment policy that is being put into effect in other sections of the Service, to transfer personnel and funds to the Air Corps.

Little Financing in July

NEW YORK (N. Y.)—Smallest for any month since August, 1928, new financing in aviation enterprises in July is reported to have totalled but $5,394,049. However, for last year, new financing is put at $111,976,408; the first quarter of this year, $93,408,125; and the second quarter $62,051,805. Great increase in financing over last year is thus apparent.

Thirty-Four Meet In Credit Conference

CLEVELAND (OHIO)—The first Aeronautical Credit Conference, sponsored by the National Credit Office, Aeronautical Division was held at the Mid-Day Club here, Wednesday, Aug. 28, during the air races. Thirty-four representatives of parts and accessory firms attended.

The trend of credit conditions was admittedly toward betterment in the cases of those producers who have amply financed themselves for an upward production curve. Discussion of nearly one hundred accounts brought out with equal emphasis, however, that many aircraft factories are operating on very limited capital and must effect substantial refinancing.

Manufacturers selling to the aeronautical industry proved alert to the need for the closest contact with these rapidly changing internal conditions. It was declared that only through exchange of payment experiences, supplemented by adequate credit reports from centers specializing in this particular field can the sources of supply co-operate to the best advantage with the existing and potential leaders in aircraft production.

It was decided that further meetings would be held concurrently with future aeronautical shows officially recognized by the Aeronautical Chamber of Commerce, and it was decided to invite additional concerns associated in this industry to join the group.

Aeronautical manufacturers whose representatives attended were: Air Associates, Inc. Aircraft Products Corporation, Aluminum Company of America, the B. G. Corporation Black & Bigelow Inc., Robert Bosch Magneto Company, Central Steel & Wire Company, Canton Drop Forging & Manufacturing Company, Consolidated Instrument Company of America, Continental Motors Corporation, Electric Storage Battery Company, Fairchild Airplane Manufacturing Corporation, B. F. Goodrich Company, Goodyear Tire & Rubber Company, Hamilton Aero Manufacturing Company, Herzel Industries Inc., Haskelite Manufacturing Corporation, Indianapolis Tool & Manufacturing Company, Johnson Airplane & Supply Company, Mewhyte Company, Michigan Screw Company, Nicholas Beazley Airplane Company, Norma Hoffmann Bearings Corporation, Ohio Seamless Tube Company, Pioneer Instrument Company, Pittsburgh Plate Glass Company, Service Steel Company, Sky Specialties Corporation, Standard Steel Propeller Company, Stewart-Hartshorn Company, Thompson Products Company, Titaline, Inc., E. S. Twining & Company, and Edgar T. Wells & Sons Company.

Pilots and Mechanics Doubled

WASHINGTON (D. C.)—Announcement is made here of increase in number of licensed airplane pilots and mechanics the 1929 figure listing 10,752 (5 641 pilots and 5,111 mechanics) compared to 5 351 (2,816 pilots and 2,535 mechanics) in 1928. June 30, 1928, totals were compared with June 30, 1929, totals.

Miami Meet Scheduled

MIAMI (FLA.) — The Miami All-American Air Meet for 1930 will be held at the municipal airport Jan. 13-14-15.

Planes Approved Reach Total of 232

Biplanes Number 144, Cabin Craft Numerous

CLEVELAND (OHIO)—Approved type certificates or approvals for license have been granted to 232 different planes now in production, according to figures made public by the Aeronautical Chamber of Commerce. These include all varieties of private and commercial aircraft and an analysis of the figures reveals a number of interesting statistics.

Biplanes are in the majority. There are 144 of this type as compared with 88 monoplanes on the market. Ten different amphibions are offered to the public, four flying boats and seaplanes and nine convertible land or seaplanes. One hundred and ninety-four of the planes receiving the Government's approval are manufactured by members of the Aeronautical Chamber of Commerce, which sanctioned the National Aeronautical Exposition here.

The rapid increase in the market for cabin craft for both commercial and private use is seen in the total of 112 different cabin planes manufactured with the Department of Commerce's approval. This is contrasted with 120 open planes, now holding but a narrow margin over the cabin planes which entered the field only a few years ago. The open cockpit planes range in size from single seaters, most of which are designed for air mail transportation, to five place types designed for passenger and taxi work. The three place open plane easily predominates in this classification, with 59 having "approved type certificates" and 17 "approved for license."

There are 30 different two place sport and training planes on the market approved by the Government. Cabin airplanes under five-place claim a total of 29 certificates, two place types having five, three-place having thirteen and four-place, eleven.

Manufacturers have received approvals for more five- and six-place planes in the cabin class than in any other type. There are 47 on the market in this field. Sixteen planes approved carry from seven to nine passengers, and seventeen carry from ten to fourteen passengrrs. Two are designed for fourteen or more persons. Study of the latter five classes indicates a belief on the part of the aircraft industry that the immediate market is either centered upon or closely linked to use of the airways for scheduled or special transport of passengers, mail and express.

The following table shows in detail the character of the 232 planes now on the market, which can obtain Department of Commerce licenses and can be sold to the public:

	With Approval Type Certificate	Approved for License	Total
Number of places	172	60	232
Monoplanes	63	25	88
Biplanes	109	35	144
Flying Boats	3	0	3
Convertible Land and Seaplanes	8	1	9
Amphibions	8	2	10
Seaplanes	0	1	1
Landplanes	153	56	209
Open Planes	91	29	120
Cabin Planes	81	31	112
One-place	0	0	0
Two place	26	9	35
Three place	71	18	89
Four place	7	5	12
Five-place	18	9	27
Six-place	18	7	25
Seven to nine-place	11	5	16
Ten to fourteen place	10	7	17
Over fourteen-place	2	0	2

Solo Students Fly White Flag

ST LOUIS (MO)—In order to distinguish student solo fliers from experienced pilots, so that other planes will not pass too close to them, the St Louis Universal Flying School has adopted the practice of attaching a white pennant to the rudder of the students' machines. The pennant bears the "flying man" insigna of the school.

Air Survey Uncovers New Alaska Power Site

NOME (ALASKA)—Discovery by the Alaska Aerial Survey Expedition of a power site of more than 20,000 hp in the Tongass National Forest, Southeastern Alaska, has been reported to the Forest Service, United States Department of Agriculture. The discovered site, lying on the east side of Taku Inlet near Greely Point, is expected to prove valuable in the manufacture of wood pulp in the Tongass Forest.

Lakes, streams, and other important topographic features of the Tongass Forest, the existence of which hitherto has not been known, have been revealed by the survey of the forest from the air.

Before the aerial survey expedition began its work, none of the greater part of the land surface of Southeastern Alaska had ever been surveyed. The shore lines of the islands and the mainland had been delineated but farther inland the maps were largely blank, even within one mile of tidewater. In 1926 a total of 10,000 sq mi was mapped. The work is now being continued this summer.

Favor Shows Minus Races

CLEVELAND (OHIO)—With the attendance at the aircraft exposition somewhat disappointing, a resolution was offered here by the Commercial Manufacturers Section of the Aeronautical Chamber of Commerce favoring future shows not held simultaneously with air races. It was found here that the events of the National Air Races conflicted in attraction with the aircraft display at the Auditorium.

Begin Tests to Find Best Aero Fuel Blends

NEW YORK (N Y)—To determine the exact anti-knock relations of various blends of motor fuel on both automobile and airplane engines, special tests have been started at the Detroit Engineering Laboratory of Ethyl Gasoline Corporation and at Wright Field, Dayton, Ohio. Ethyl Gasoline Corporation, owned jointly by General Motors and Standard Oil Company of New Jersey, and the Army engineers will work in conjunction and will check each other on a number of blends of fuel.

Although the tests have been in operation for several months in Detroit, this is the first actual attempt to compare the fuels in this way. As a mechanical check at both places, special knock testing machines which have recently been developed will be in operation.

The test has been planned for several weeks at the Army aviation quarters at Wright Field, where considerable work is being done to determine a better blend of tetraethyl lead for airplanes. It is hoped by Army engineers to arrive at a blend which will be two or three times the usual formula of three centimeters per gallon which is used for automobiles. Although many commercial planes are using this blend, military preparedness demands a fuel which will have the greatest possible power in proportion to its weight.

Approve Eight More Planes

WASHINGTON (D C)—Eight more approved type certificates for airplanes are announced as we go to press. According to certificate, make and designation, type power plant, useful load and gross load, they are as follows: No 210—General 102-E, three-place cabin monoplane, Whirlwind Five, 776 lb, 2,300 lb. No 211—Boeing 203-A, three-place open biplane, Whirlwind Five, 788 lb., 2,577 lb.; No 212—Stinson SM-1-FS, six-place cabin monoplane seaplane, Edo J Floats, Whirlwind Nine, 1,502 lb.; 4,700 lb. No 213—Curtiss Falcon, two place open biplane, 600 hp Geared Conqueror, 1,898 lb., 5,265 lb.; No 214—Command-Aire 5C-3B, three-place open biplane, Axelson 869 lb., 2,372 lb.; No 215—Kreider-Reisner C6-B, two-place open biplane, Kinner, 535 lb., 1,550 lb., No 216—New Standard D-29 A, two-place open biplane, Kinner, 535 lb., 1,610 lb.; and No 217—Stinson SM-6B, eight-place cabin monoplane, 450 hp Wasp, 1,854 lb., 5,350 lb.

Canadian Firm Making Floats

MONTREAL (QUE.)—General Aircraft Builders Ltd., branch of General Auto Body Company, Ltd., this city, is producing on a standard production basis standard floats for aircraft. Six types of floats are offered. The company designs and constructs the chassis to fit individual machines.

Engine Approvals

WASHINGTON (D. C.)—Twenty-five engines have now received approved type certificates, and the application of one more is pending. Twenty-four engines have been approved for license without type certificates. Approved types are:

Cert No	Name and Model	Designation	Rated Hp	Rated R p m
1	Fairchild Caminez 447-C.	4KA	120	960
2	Warner Scarab	7ZA	110	1950
3	Kinner K 5	5RA	90	1810
4	Velie V-5	5JA	55	1815
5	Curtiss Challenger R-600	6RA	170	1800
6	Curtiss Conqueror V 1570	12VW	600	2400
7	Curtiss Conqueror GV-1570	12VW	600	2400
8	Curtiss Chieftain H 1640	12RA	600	2200
9	Arrecall Comet	7IA	130	1825
10	Curtiss D-12	12VW	435	2300
11	Dayton Beat	4LA	100	1500
12	LeBlond 60	5RA	65	1950
13	Wright J-5 Whirlwind.	9RA	220	1900
14	Pratt & Whitney Wasp	9RA	450	2100
15	Pratt & Whitney Hornet	9RA	525	1900
16	Arrelaire	7IA	115	1890
17	Wright Cyclone	9RA	525	1950
18	Packard 3A 1500 (direct)	12VW	525	2100
19	Packard 3A-2500 (direct)	12VW	800	2000
20	LeBlond 90	7RA	90	1975
21	Wright R-975	9RA	300	2000
22	Harris B-1	8VW	90	1400
23	Wright R 540	5RA	165	2000
24	Hess Warrior	7IA	115	1925
25	Rover	4LAI	55	1900

Approved for license without approved type certificate:

Name	Model	Designation	Rated Hp	Rated R P M
*A D C	Cirrus Mark III	4LA	85	1900
*Armstrong-Siddeley	Genet Mark II	4LA	60	2200
*Bristol	Jupiter XI	9RA	500	2000
*Bristol	Jupiter VI AL	9RA	460	1765
Curtiss	OX-5	8VW	90	1400
Curtiss	OXX	8VW	102	1400
Curtiss	C-6	6LW	160	1750
Curtiss	K 6	6LW	150	1700
*D-Havilland	Gipsy	4LA	85	1900
Hall-Scott	L4	4LW	125	1650
*Junkers	L5	6LW	300	1400
Liberty	12A	12VW	400	1700
*Salmson	AD-9	9RA	40	2000
*Siemens-Halske	SH-4	5RA	60	1550
*Siemens-Halske	SH-10	5RA	70	1557
*Siemens-Halske	SH-11	7RA	100	1584
*Siemens-Halske	SH-12	9RA	112	1575
*Siemens-Halske	SH 13	5RA	82	1656
*Siemens-Halske	SH-14	7RA	105	1628
*Walter	N2	9RA	120	1600
Wright-Hispano	A	8VW	150	1450
Wright-Hispano	D	8VW	200	2200
Wright-Hispano	E	8VW	180	1800
Wright-Hispano	I	8VW	150	1450

*Imported engines (temporary approval)
Designation No. = no. of cylinders. L = L-head. R = Radial. V = Vee-type. A = Aircooled. W = Water cooled. t = inverted.

Bellanca "Tandem" Completed

NEW CASTLE (DEL.)—Bellanca Aircraft Corporation has completed its first twin-engined passenger biplane powered by Wasps in tandem arrangement. The new plane has a wing spread of 84 ft., its tail being supported by four outriggers. The wing cellule might be considered as one of two bay design, the inner has being similar to that of a biplane and the other bay closely resembling a braced monoplane. A non-refueling endurance flight is planned with the plane. [A full description of the new craft will be found in an early issue of AVIATION—Ed.]

Watkins Completing Low-Wings

WICHITA (KAN.)—E. A. Watkins, of Watkins Aircraft Company, states that three more low-wing monoplanes similar to the "Skylark" will be completed and in the air by Sept. 15.

Turkish Aviation Mission in United States

MEMBERS OF THE TURKISH AERONAUTICAL MISSION, which arrived in the United States Aug. 12, have been spending the past week in St. Louis and Wichita. They will go on to San Antonio and west to Los Angeles and San Diego, returning to New York Sept. 18 via Transcontinental Air Transport. Thus far they have visited several airports and airplane factories in the East and Middle West, and they stopped at Cleveland to see the Exposition and part of the National Air Races. Reading from left to right they are, Moulis Bey, Lieut. Khazim Bey, Maj. Shefik Bey, chief of the Turkish General Staff for Aviation, Ahmed Emin Bey, Capt. Turhan Ferruh Bey.

Kinner Branch for Wichita

WICHITA (KAN.)—Robert Porter, vice president of Kinner Airplane & Motor Corporation, Los Angeles, announces that his firm will establish a branch factory in Wichita. A lease has been taken on the airport formerly occupied by Pacific Southwest Airways due north of the Travel Air factory. Both the Kinner company and the newly organized Buckley Aircraft Company will use the field. Parts and service of Kinner engines will be the first step under the direction of W. B. Allison district representative of Kinner, according to Mr. Porter. An assembling factory will follow. It is estimated the first factory unit will cost $50 000.

Chicago Wants 1930 Races

CHICAGO (ILL.)—To make an effort to bring the 1930 National Air Races to Chicago, a committee was recently appointed to convene on this plan with officials of the N A A. Members of the local group include Col. Paul Henderson, Maj. Reed Landis and Maj. R. W. Schroeder. A non-profit corporation to sponsor the classic is planned, with $250 000 to be raised and posted as a guarantee.

Martin Company Buys 200 Tons of Aluminum

BALTIMORE (MD.)—Glenn L. Martin Company has purchased 200 tons of sheet aluminum to be used in the manufacture of airplanes. An all-metal plane is now in process of construction, and it is anticipated that it will be used for experiments to develop a commercial all-metal plane for general distribution. The company has already made plans for an extensive building program.

As soon as equipment and materials can be assembled, the new $2,500 000 factory will begin operation, probably about Sept. 15. Construction of thirty seaplanes and ten flying boats for the Navy, including one which will cost $150,000, will be started immediately. Before the first of the year, according to present plans, the personnel of 300 will be increased to 1,200.

Rescue Training With Loening

ANACOSTIA (D C.)—The Naval Air Station here has established a school for training men in rescue and salvage work in shallow water. The equipment is a Keystone-Loening (OL-8), and three crash boats, which will carry equipment for shallow diving and first aid kits.

New York State Leads in Planes

Has 753 Licensed Craft; California, Illinois Follow

CLEVELAND (OHIO)—In number of planes licensed or identified, New York State now leads California by 234, according to a recent survey by the Aeronautical Chamber of Commerce made public here Twelve states, it is shown, have more than 100 planes, while only four others have more than 50, and three states have less than five planes each

New York has 753 licensed planes; California, 519, Illinois, 300, to lead the list of twelve states having more than 100 planes each The survey shows that there are 7,117 planes of all types operating under license or identification numbers of the Department of Commerce 2,885 identified and 4,232 licensed.

Pennsylvania is fourth with 244, Michigan has 235; Ohio, 230, Missouri, 193, Texas, 173; Oklahoma, 134; Wisconsin, 121; Massachusetts, 109 Washington, 108

Computed upon the basis of the 1928 population estimates, California has proved itself the most fertile airplane market, having one airplane for every 8 778 persons The District of Columbia, with its large official population, ranks second with one plane for every 9,200 persons Washington is third with one plane for every 14,694 people, Delaware has one for every 15,250, New York, one for every 15,338, Oklahoma, one for every 18,104

The market for open land biplanes has proved itself the largest in numbers, with 2 991 planes licensed in this class Cabin land monoplanes are next in favor, with 1 093 licensed by the Department of Commerce and operating July 15

The following table shows the total number of licensed airplanes in each state and the number of persons per plane in each commonwealth

State	Airplanes	Population per Airplane
Alabama	15	121 533
Arizona	15	31 600
Arkansas	24	81 000
California	519	8 778
Colorado	37	29 459
Connecticut	43	38 767
Delaware	16	15 250
District of Columbia	60	9 200
Florida	36	39 194
Georgia	20	160 150
Idaho	14	39 000
Illinois	300	24 653
Indiana	64	52 809
Iowa	51	47 600
Kansas	81	22 654
Kentucky	18	141 833
Louisiana	44	44 318
Maine	4	198 750
Maryland	32	50 500
Massachusetts	109	39 357
Michigan	235	19 540
Minnesota	92	29 586
Mississippi	18	99 500
Missouri	193	18 253
Montana	19	28 894
Nebraska	40	35 200
Nevada	2	33 500
New Hampshire	9	85 333
New Jersey	92	39 391
New Mexico	3	132 000
New York	753	15 338
North Carolina	29	101 345
North Dakota	14	45 706
Ohio	230	28 678
Oklahoma	134	18 104
Oregon	36	22 227
Pennsylvania	244	40 035
Rhode Island	9	79 555
South Carolina	13	143 307
South Dakota	29	25 145
Tennessee	33	75 818
Texas	173	31 716
Utah	21	25 205
Vermont	6	76 000
Virginia	26	99 038
Washington	108	14 694
West Virginia	7	246 286
Wisconsin	121	24 404
Wyoming	10	109 000

Offer Emergency Gasoline Pumps

WEST SPRINGFIELD (MASS)—Emergency landing fields are not usually equipped with gasoline pumps capable of supplying fuel to an airplane directly, and it is frequently something of a problem to transfer gasoline from barrels to the plane's fuel tank To provide for this, Gilbert & Barker Manufacturing Company has developed a small portable aluminum pump, only 5 in thick, 8 in wide and 18 in high, weighing 10 lb, which is capable of pumping 8-10 gal a minute The size and weight of the pump permit carrying it in the plane.

Will Build Addition To Friez Firm Plant

NEW YORK (N Y.)—Consolidated Instrument Company of America, Inc, announces that the old meteorological observatory of their subsidiary, Julien P Friez & Sons of Baltimore will shortly be pulled down and a new and up to date building erected as an addition to the present offices and factory in the rear

"Belfort Observatory" is the second oldest building in Baltimore, and dates back over 175 yr It was for some time used as the residence of the late Julien P Friez and since 1876 has been the meteorological observatory of the company

Friez manufactures standard weather instruments which have been used for years by the U S Weather Bureau, and are now installed in a great many airports

Backer for Williams in 1931

ANNAPOLIS (MD)—That Lieut Alford J Williams' attempts to win the Schneider Cup with his Mercury racer are not in vain was assured when an unnamed wealthy private backer recently agreed to finance the construction of three racing seaplanes to represent the United States in the 1931 Schneider races, according to a recent announcement

New Engineers Course Offered at New York U.

NEW YORK (N Y)—Practical Aviation Engineering is one of the new three-year practical courses leading to certificates of proficiency which will be offered this year by the Evening Engineering Division, New York University, according to an announcement by Collin P Bliss, associate dean The course has been designed to provide men already engaged in the industry with technical training "becoming more and more a necessary adjunct to practical engineering"

In making the announcement Dean Bliss stated that although it is desirable that an applicant should have preparation equivalent to high school graduation, students with less preparation would be admitted provided they had sufficient maturity of experience Those having advanced standing from recognized sources satisfactory to the University may be able to complete the work in less than three years

All of the lecture work in the courses will be given at the Washington Square Center of the University, while the laboratory work will be conducted at University Heights. Registration will be at the Washington Square Center until Sept 11

The course in aviation engineering is intended for those associated with the practical commercial use of aeroplanes who have not had the time or the preparation to take a full four-year course in advanced aeronautical engineering

This course was prepared under the direction of an advisory board consisting of Harry F Guggenheim, C M Jones, Dr James H Kimball, Capt Richard H Depew and Prof Alexander Klemin. It includes elementary aerodynamics, aeronautical meteorology, navigation and instruments, applications of electricity in aviation, cost accounting, elementary plane structures, air transportation, airports and airways, airplane engines and installation, sales, uses, and statistics of aircraft

Conqueror Cut $1,350-$1,500

CLEVELAND (OHIO)—Reduction in price of $1 350-$1 500 for the Curtiss Conqueror engines was announced here during the National Air Races. Made in both direct drive and two-to-one reduction gearing, the power plant now sells as follows Direct drive, former list price $10,500, new list price $9,150, geared, formerly $12,000, now $10,500. These reductions have been effected by increased orders and production

Varney Buys Metro Air Service

OAKLAND (CAL.) — Varney Air Lines, operator of the Pasco-Salt Lake air mail route, has purchased the Metro Air Service, Stearman distributor for Northern California and Hawaii Metro will retain its identity with headquarters at the Oakland Airport.

BRIEFLY

New records were made by Colonial Air Transport passenger service between New York and Boston, in carrying 95 passengers from Boston, and 123 from New York, totaling 218 passengers carried in one week, with pilots operating on a 100 per cent schedule

Boston air mail will be rushed from the Summer Street landing at South Station by speedboat in eleven minutes to the East Boston Airport to catch the Colonial plane to New York after October 15

Hamilton Maxwell, Inc, of Springdale, Conn, will be supplied by Aero Corporation of California with flying equipment and personnel for the making of aero maps, surveys and photos in the territory included in California Arizona, New Mexico, Texas, Utah, Nevada, Washington and Oregon

A gliding club has just been organized by the Newark Chapter, American Association of Engineers to be affiliated with the National Glider Association, of Detroit.

Berliner Joyce Aircraft Company, Baltimore, Md, has secured five government contracts, four from the Navy and one from the Army in the past three months, for fighters, observation planes, pursuit planes, pontoons and floats.

Metal Aircraft Corporation, Cincinnati, is now producing one plane a week, with present orders filling the next two months The production department will shortly be enlarged to include Flamingo monoplanes. Three tapered wing biplanes, powered by Wright Whirlwind, are being manufactured at the Waco Aircraft Company's Troy, Ohio, plant for the Government of San Salvador

Universal Air Lines reports an average passenger increase of 26 per cent per month since Jan 1, 1929, on the St Louis-Chicago Line and St Louis-Kansas City-Omaha Line

Preparations are being made for 25,000 spectators to see the international balloon races start from St Louis September 28,

Cook Glider & Soarplane Company has taken over the building at 418 West Sixth St., Kansas City, Mo, to be used for a factory

Twenty-five women of Kansas City, Kan, Kansas City and Independence, Mo, organized a women's division of the National Aeronautic Association.

Embry-Riddle Company, operator of the Cincinnati-Indianapolis-Chicago air mail and passenger line, has moved to the new $75,000 Curtiss Flying Service hangar at Stout Field, Indianapolis.

"Mark Your Town Week" has been proclaimed by Gov. Harry G Leslie of Indiana, to begin Sept. 9, in anticipation of the first national air tour of the state

Milwaukee, Wis, was selected as the 1930 convention city of the Second Regiment Air Service Mechanics

Axelson Aircraft Engine Company, Los Angeles, has published a new catalog illustrating Type B engine, which is the improved power plant recently presented at the Cleveland Show.

Boeing Airplane Company of Seattle, Wash, plans to complete one of the new $70,000 18 passenger tri-engined San Francisco-Chicago planes every ten days

Alaska-Washington Airways will soon resume regular passenger service with two trips daily between Victoria, B C, and Seattle, Wash

A trans-Pacific flight, Tokio to Seattle, using a Bellanca monoplane to be refueled en route is being planned by Lonnie Brennon, Gorst Air Transport pilot, of Bremerton, Wash

One hundred and sixty acres of land on Lummi Island, near Bellingham Wash, were recently seeded by airplane in 1 hr 40 min

DeHaviland Company Toronto Ont is completing a new plant on a 70 acre site, having produced more than one hundred planes in the last six months

The Boeing System carried 550 tons of air mail on its transcontinental and Pacific Coast routes during the first seven months of 1929, which is an increase of more than 200 per cent over the 1928 figures for the same months

William Templeton, superintendent of the Vancouver (B C.) airport, has left for one month's tour of the various airports in the United States, to study airport facilities

The Scenic Airways, Inc, is planning the establishment of a ground school in Phoenix, Ariz, next winter

AERONAUTICAL CALENDAR

Aug. 23-Sept 3	Second National Aircraft Show, Toronto Canada
Sept. 2-7	Class C Aviation Exhibit Rochester Exposition at Rochester N Y
Sept 6-7	Schneider Cup Race over the Solent, Cowes England
Sept. 9-14	Nebraska Air Tour, auspices Omaha Chamber of Commerce
Sept. 16-18	First National Air Traffic Conference Murlbeah Hotel, Kansas City, Mo
Sept. 23-28	Fourth Annual New England Aviation Exposition Boston Garden Boston Mass
Sept. 28	Gordon Bennett Balloon Trophy Race St Louis, Mo
Oct. 5-21	National Air Tour, Starting from Ford Airport Dearborn Mich
Oct. 12-27	Southwestern Aircraft Exposition State Fair Grounds, Dallas, Tex.
Oct. 24-25	Conferences on Municipal Airports at Washington D C. under auspices of the American Road Builders Association
Nov 18	Lehigh Airport Design Commodities Classes, Lehigh Portland Cement Company
1930 February	National Air Show, auspices Aeronautical Chamber of Commerce, St. Louis
Feb 5-12	New York Aviation Show auspices Aviators Post, American Legion
April 5-13	All-American Aircraft Show Detroit
May 3-10	New York Aircraft Salon auspices Metropolitan New York Division, Distributor-Dealers Section Aeronautical Chamber of Commerce at Madison Square Garden New York City

TRADE TIPS

It has been reported that

Nelsen Steel Aircraft Company, Second and Camelia Sts., Berekley, Calif, is taking bids on construction of a 60x200 ft addition to its plant

Iowa City, Ia., voted $70 000 bonds for establishing and maintenance of municipal airport

Springfield, Mo, is taking bids on lighting system and the construction of administration building costing $8,000, at the municipal airport

The City Commission, of Hattiesburg, Miss, will immediately let the contract for hangar and other improvements to its municipal airport.

Menomonie Airways, Menomonie, Wis which has developed an airport near the city is planning the erection of a hangar in the near future.

Pierce County Airport of Tacoma, Wash, is about to let the contract for construction of a 132x200 ft hangar with clearance of 25 ft, costing $40 000

Anderson, S C. will appropriate $50,000 for the establishment of an airport.

Sidney, Ohio, has formed a flying club with Frank Hetzel, president.

Grant Zickgraf, 16-year-old aviator of Tampa, Fla., will purchase a plane as soon as he completes a 50 hr. training course at the McMullen Flying School

Mutual Flier's Club of Nebraska will build a $30,000 hangar 100x150 ft near Lincoln

Phoenix Ariz., City Commission will lease the Municipal Airport to the highest commercial bidder

The Dallas Airports Utilities Corporation will take bids on construction of hangar and administration building costing $90 000 at Love Field

The City Clerk of Visalia, Calif, will advertise for bids for construction of an administration building at the Visalia Airport

Bowers Airport Corporation, will establish an airport at Belleville, Kan., costing $20 000

Boeing Moves to Cheyenne

CHEYENNE (WYO)—The Boeing System has moved its offices and shops from Salt Lake City and Omaha, Neb., to this city This brings D E Collyer, vice-president in charge of transportation and P E Caldwell, general superintendent, from the Utah capitol to the Wyoming capitol Boeing was granted a 25-year lease on a portion of the Municipal Airport, including four hangars, and a plot of ground upon which the company may erect such buildings as are necessary for the service It has been announced that the first buildings to be erected is a hangar 120x200 ft, capable of housing about six large planes The cost is estimated at $100,000 Then will come office building and passenger station

PERSONNEL

PAUL FITZSIMMONS, NORVAL A HAWKINS and HARLAND TIBBETTS are the new members of the Board of the Dayton Airplane Engine Company

ALDEN LIVINGTON, former manager of Mid-West Airways, Inc, field at Cedar Falls, Ia, is now manager of the Waterloo, Ia, port

S T SCRIPPS formerly ot the Central Flying School, Gosport England, is now instructor for the St. John (N B) Flying Club

EDWARD HURLBERT has been named sales manager for Curtiss Flying Service at Memphis, Tenn

A P McCULLOUGH has been appointed sales manager for the Universal Flying School, Oklahoma City

WILLIAM C BENTON is manager of the Culver City Airport, near Los Angeles, Cal, succeeding A E MacManus Jr

D J COLYER has been made vice-president, and L E MILLER purchasing agent of the Owl Aircraft and Motors Corp, of Lincoln, Neb

DOUGLAS M CAMPBELL has been made principal of the ground school of the Universal Aviation School at Wichita Kan.

JAMES MALONE has been appointed chief instructor at the Von Hoffmann Flying School L F O'ROURKE has been appointed service manager of the Von Hoffmann Aircraft Company

LIEUT J F FISHER will teach air commerce law, navigation and meteorology at the Parks ground school

A E MONTEITH of the Associated Aircraft Inc of Hollywood Cal has been made director of maintenance for the Pickwick Airways Los Angeles

JOHN CUNNINGHAM of Detroit was made chief airplane inspector at Arrow Aircraft and Motors Corporation

W J HUSCH formerly with Central Air Lines of Wichita Kansas has been appointed city sales manager with charge of the downtown office of Braley Flying School

RALPH H ROLAND has been made sales manager and CHARLES L CORWIN has been made assistant sales manager of Champion Spark Plug Company

JOE C BLYTHE has been made president GERALD O BLACK vice-president H H STRICKLAND secretary and CAPT ADRIAN W REEVES assistant chief pilot of National Airways Inc, of Detroit

C M NASH of Fort Meyers has accepted a position as chief flying instructor with Strickland-Williams Flying Service Municipal Airport of Tampa, Fla

LIEUT EDGAR E CHAPPELL of Denver is now general manager of the United States Airways Inc Chappell formerly Army Air Corps officer, will make his headquarters at Kansas City, Mo

DONALD SANFORD MICHAELSEN Western manufacturing executive, has become executive assistant to the president of Fairchild Aviation Corporation.

THORWALD JOHNSON, Minneapolis pilot, has been appointed pilot on the Twin Cities-Winnipeg line of Canadian-American Air Lines, Inc

LIEUT JACK FRYE, president of the Aeronautical Corporation of California, was appointed a member of the Flying School Section Committee of the Aeronautical Chamber of Commerce of America, New York

LIEUT DANIEL F KEARNS has been appointed to the staff of the Aviation Corporation of America, Chicago

Schools and Colleges

AIR SERVICE, INC, Kansas City, Mo., will double its aircraft welding school capacity to 120 students

THE CAMDEN COUNTY VOCATIONAL SCHOOL, N J, will offer courses in aero mechanics for boys between the ages of 14 and 18 this fall

NEW YORK UNIVERSITY will open its first training course in aviation for women on September 16 at New York University, it was announced by Roland H Spalding, director of the Curtiss Flying School

UNIVERSITY OF WASHINGTON, aided by the Daniel Guggenheim Fund, will launch a course in aviation this fall.

UNIVERSITY OF SOUTHERN CALIFORNIA is to offer a course in physics of atmosphere designed especially for students of aerial navigation

OKLAHOMA AGRICULTURAL AND MINERAL COLLEGE Stillwater, Okla, is planning to establish a department of aeronautical engineering, design and construction

Gets Venezuelan Contract

NEW YORK (N Y)—Venezuela has given the New York Rio & Buenos Aires Line, Inc, of this city an exclusive contract for transportation of Venezuelan air mail to this country according to a recent announcement of the company This is the third such agreement the company has secured the other two being made with the Governments of Argentina and Uruguay The company will be paid $6 40 $10 and $6 40 per lb of air mail carried, respectively Beside United States mail the agreement just made includes air mails to Canada, Haiti, Santo Domingo, Porto Rico Guadeloupee, Martinique and Trinidad, it is reported

Braniff Starts Express Service

OKLAHOMA CITY (OKLA)—The Southwest will have available a second air express and package service which began Sept 1 over the Braniff Airlines The Braniff service includes collection and delivery service in all important points Both Braniff and Southwest Air Fast Express are now carrying express

New Firms Announced

GODDALL AIRWAYS COMPANY, of Beloit, Wis, capital, 250 shares no par-value stock, by Harold H Rockwell, E J McNeany and E. E. Crowley

INTERNATIONAL FLYING SERVICE, Inc Miami, Fla capital 200 shares no par-value stock; by E. O Smith, A F Katzentine and W T Hargarett, to operate a flying school

WESTERN AIRWAYS, INC Oklahoma City, Okla capital $10,000, to manufacture and sell planes and operate an air transport service

NEW YORK CITY AIRPORT, INC, 7 Dey Street, New York City, capital 90,000 $5 par-value class A shares and 50,000 no par-value class B shares, by J Cyril Donoghue

BARNES AIRPORT FLYING SERVICE, Westfield, Mass; by Charles O'Connor and Edward Lynch

SOUTHERN FLYERS, INC, Chattanooga, Tenn; capital $50,000, by Tarebell Patten Henry Hart, Jr to deal in airplanes and provide air transportation.

ST JAMES AIRCRAFT COMPANY St James Mo capital $15 000 by George A. Morris and D B Mitchell; to operate airplanes and conduct a ground school

CLARKESVILLE AIRPORT COMPANY, INC. Clarksville, Tenn; capital $25 000

PADUCAH AIR COLLEGE Paducah, Ky., capital $30 000 by C R Iseman, C G Vahlkamp G H Mitchell E. C Mitchell G H Goodman and W F Bradshaw

EARL AVIATION CORPORATION, LTD Los Angeles, Calif, capital 10,000 shares of no par-value stock, by J D Bunch, Chaffee Earl and T J. Jarvis

UNIVERSITY AERIAL AIR SERVICE, Austin Tex; capital $125 000, by S Webb Ruff, of Austin Frank Kirk, of Eastland, and others, to conduct a general passenger and commercial aviation service a modern airport and a flying school

PUBLIC SERVICE AVIATION CORPORATION 75 Maiden Lane New York City capital 250 000 shares no par-value stock; Meie H Avram, president a holding company to deal in aviation securities.

THE SOUTHERN CALIFORNIA AIRWAYS INC Los Angeles, Calif, capital $24 000; L W Hughes, Ralph D McCullough, John W Moreland and J H Chapman

THE AERO TRUSS PRODUCTS CORPORATION, Los Angeles, Calif, to take over the Aero Truss metal wing business of the Largent company and to manufacture metal spars, wings and fuselages

TEMISCOUTA AIR TRANSPORT COMPANY, LTD, Notre Dame du Lac, Temiscouta County Canada capital $25 000

SUPERIOR AIRCRAFT CORPORATION Kansas City; by Leo Mohme J W Kennedy Harry Smedley, J B Lowen, and W D Patterson.

AIRPORTS AND AIRLINES

To Inspect Ports Seeking Official Rating

WASHINGTON (D C)—A field inspection trip will be made by Aeronautics Branch officials within the next several weeks to check the few airports whose rating requests indicate that a physical examination is justified In the majority of cases, however, it is stated that the data submitted with the applications, indicates additional work will have to be done before the airports can meet the requirements of the rating for which they ask. Reports from many other cities which have not yet filed applications for rating, make it apparent that they are soon about to do so

In view of the fact that requests for rating are coming to Washington in greater numbers every week, officials of the Aeronautics Branch believe that much time can be saved if those responsible for these requests would study the specifications more carefully It is the opinion of the Government men that a little more consideration of the problem would convince some communities that it is physically impossible for them to obtain the rating that they would like to get

Some sections are handicapped by topographical and climatic conditions and must realize their limitations, it is pointed out Were the Commerce Department to abandon its uniform yardstick principle in grading fields and to consider local conditions, the main benefit of the rating work, which is service to pilots would be lost it is held It will therefore be the policy to adhere strictly to rating requirements

Colonial, Western Union Report

BOSTON (MASS.) — Colonial Air Transport completed its first week of air express between Boston and New York, in co-operation with the Western Union messenger service on Aug. 24 A total of sixteen packages were carried from Boston and fourteen received from New York Of 28 trips scheduled for the seven days Colonial completed the entire number Total number of passengers carried from Boston to New York 113, New York to Boston 83

Central Air Lines Reports

WICHITA (KAN)—Since Feb 17, when Central Air Lines of Wichita began operations passenger planes of the company have covered a half million miles with no passengers or pilots injured no planes badly damaged and with an "on time" schedule of better than 90 per cent according to E A Watkins, president

Montreal-Detroit Line Success

OTTAWA (ONT)—Since the inauguration of the Montreal-Detroit air mail service on July 15, the planes have flown a total of 61,562 mi with satisfactory regularity and without a failure of any kind. The average flying time for the route is 5 hr 57 min for the 557 mi

Plan Air Rail Service To Speed Mail Delivery

WASHINGTON (D C) — Combined air-mail special delivery service for first class mail is the latest plan developed by the Post Office Department Under the proposed system, letters would be handled to reach their destination in the shortest possible time, whether transported by air, rail, or both depending upon the route, the time of day received, and other factors Delivery of mail direct from airports by messenger is another feature which may be incorporated in the service

It is expected that this proposed arrangement will remove objections which have been made to the use of the present air mail service on the grounds that it is not always faster than rail due to poor connections, unavoidable weather delays or lack of air lines direct to the point of destination, etc A single charge which has not yet been fixed would cover the entire service, including special delivery, and a special stamp will probably be issued for it

Varney to Start New Line Sept. 15

WASHINGTON (D C)—Direct connection between the transcontinental air mail route and cities of the Northwest will be provided beginning Sept 15 by the new service from Pasco Wash., to Spokane, Portland, Tacoma and Seattle The schedule announced by W. Irving Glover, Assistant Postmaster General, calls for two trips a day in each direction In order to make connections, the schedule on the air mail route from Salt Lake City to Pasco will be changed Varney Air Lines, Inc San Francisco, has the contract for the new route at a rate of $.09 per lb [This new mail line was described on page 451 issue of August 24—ED.]

St. Louis-Omaha Night Mail Near

ST LOUIS (MO)—The night mail service between this city and Omaha will be started Sept 15. Opening of the line follows the complete installation of landing fields and lighting equipment, for which the Robertson Division of Universal has been waiting some time.

Pan American Opens Extensions

Rivals Also Report Plans in South America

NEW YORK, (N Y)—Three extensions of the air mail service to South and Central America, operated by Pan American Airways, Inc, were recently announced Beginning Sept 2, the Foreign Air Mail Contract Route No 8, now operating on a daily basis from Brownsville, Tex., to Mexico City, was extended to Guatemala City, Guatemala on a tri-weekly service The tri-engined Fords and bi-engined Sikorsky amphibions used by Pan American make this 1,418 mi jaunt in three days, saving 10 days from the regular boat mail service from New York. The air mail rate from any point in the United States is $.15 for the first ½ oz or fraction thereof Since the planes leave Brownsville at 8 a m on Sundays, Tuesdays and Thursdays, it is estimated that letters should be posted in New York two days before, and should be marked 'Via Air Mail, Brownsville, Tex"

Amounce Rates to Curacao

Air mail postage rates on F A M No 5 from Cristobal to Curacao an extension of the older Miami-Cristobal route have recently been approved by the Postmaster General A letter posted air mail anywhere in U S A must bear $.40 in stamps of this country, and be marked "Air Mail via Miami, Fla" The tri-weekly Miami-Cristobal service is supplemented by a weekly 923 mi. water route to Curacao, Dutch West fndies, taking four days. fn addition to being more frequent than any boat service, this air mail route saves more than 50 per cent of the time required by boat. Letters mailed in New York before 6 p m on Sundays will reach Curacao the following Wednesday afternoon

To Reach Dutch Guiana

An extension of F A M No 6 (Miami-San Juan) will be made Sept 22 from San Juan to Paramaribo Dutch Guiana, effecting savings of more than a week from the regular boat service, as the amphibions used on this route cover the 2,716 mi from Florida to Dutch Guiana in 4½ days The rate for the first ½ oz is $.40 by air mail from any point in the United States, and letters mailed from New York before 6 p m. Wednesdays reach Paramaribo the following Monday noon

Stops on the new route will be St. Thomas Virgin Islands; St Johns, Antigua Leeward Islands Castries St.

(Continued on page 551)

AIRPORT CONSTRUCTION PROJECTS

A $200,000 airport is to be established at Brunswick, Ga., on an island between Little and Black Rivers. It will be a combination seaplane and airplane port. Roosevelt Field, of New York, has signed contracts through Stone & Webster for the erection of eight steel and concrete buildings providing a 100,000 sq ft. of hangar space and 60,000 sq ft of office, shop and exposition space, involving $75,000. Most of the space in these new buildings has already been leased to leading manufacturers and dealers.

Erection of a government radio station at the Albany Airport is being contemplated by Department of Commerce officials. Twenty seven boundary and approach lights for the Boston East Airport are now being installed, conforming to the Department of Commerce regulations. A large revolving beacon and flood lights have been erected at the Springfield, Mass., airport in anticipation of the arrival of the National Air Tour, on Sept. 7. The Amsterdam, N. Y., Chamber of Commerce has recently acquired a 130-acre plot for the development of an airport three miles from the city.

Miami, Fla., now has five airports and five seaplane bases, although there are many other places on both land and water where planes may operate from. Installation of a 160-acre airport for Coco, Fla., is now being finished, with the installation of night lighting equipment.

Stinson Gets Knoxville Tract

Stinson Aircraft Corporation, Wayne Mich., is reported planning establishment of an airport at Knoxville, Tenn. Trout Creek Lumber Company is clearing a site and will establish a landing field at Good Pine, La. Mid Southern Air Terminals, Inc., of Little Rock Ark., will soon start construction of a $300,000 airport with complete accommodations.

Nebraska airports are attracting unusual activity in their development, in anticipation of Nebraska's first air tour. Fall City, Neb., is to have an 80-acre airport two miles from the city. Midwest Aviation Corporation has moved its offices and planes into a new $18,000 hangar at the Omaha Municipal Airport. Mutual Flyers' Club, of Nebraska, will erect a $10,000 hangar at Lincoln Municipal Airport, with accommodations for eighteen planes. A fueling unit, costing $100,000, will be built at this municipal airport. The Arrow Aircraft and Motors Corporation has recently completed a 100 x 80 ft. hangar at the Woodport Lincoln, airport. The American Legion airport at McCook, Neb., will soon start construction of a wooden hangar to cost $750. Midwest Aviation Corporation proposes the erection of a $15,000 hangar at the Municipal Flying Field of Des Moines, Ia.

North American Air Lines, Inc., of Tulsa, Okla., recently purchased a 160-acre tract to be developed into a $30,000 airport which will be included in its St. Louis-Los Angeles chain. Work is soon to be started on the construction of service stations, hangars, and runways for the Cushing, Okla., Airport. Rapid Air Lines, Inc., of Rapid City, S. D., completed arrangements for the establishment of an airport two miles from Miller, S. D. Airplanes now stop at Miller on the trip between Rapid City and Watertown.

City officials, civic clubs and citizens of Deadwood, S. D., and Lead, S. D., will install a joint airport in the Black Hills country. Contract has been awarded for the construction of a new station building costing over $68,000 at Boeing Field, King County's Public Airport, Seattle, Wash.

Curtiss Flying Service, Inc., of New York, has bought a 450-acre field five miles from Houston, Texas, where a $2,500,000 airport is to be developed.

Improvements costing $60,000 will be made at the Texas Air Transport's New Orleans airport providing for new runways, service hangars and passenger buildings. Weather service for flyers using the Moline (Ill.) Airport will undoubtedly be augmented as a result of a recent conference of meteorological and N.A.T. officials. The City Council of St. John, N. B., will build a three-plane hangar at the St. John Airport. Construction of a $195,000 Harbox Field at Muskogee, Okla., has been started. The aviation committee, of Millers Falls and Turners Falls, Mass., have voted to form a $50,000 airport corporation. City officials of West Point, Miss., have been authorized to spend $4,000 in the purchase and development of an 80-acre tract for a municipal airport.

To Start Hawaiian Service in November

LOS ANGELES (CALIF.)—Inauguration of flying service between cities of the Hawaiian Islands is scheduled to start on or about November 10, according to officials of the Aero Corporation of California, Los Angeles, which concern has a substantial interest in Hawaiian Airways, Ltd., operators of the new service. Tri-engined Fokker F-10 transport planes will be operated over the main routes of the Hawaiian service with single engined Fokker Universals for charter trips and scenic service.

Two F-10's have already been shipped to the Islands and four more will be delivered through the Aero Corporation of California before the end of the year. A total of ten planes is expected to be placed in service at an early date. Five flying fields have been leased or developed and five more are in the course of construction. G. Fred Bush is head of the Hawaiian Airways, Ltd., while directors include Jack Frye, president, and Paul Richter vice-president, of the Aero Corporation of California; William Gibbs MacAdoo, and Nathan Newby, Jr.

Airport Dedications

Utica, N. Y., Airport will be dedicated Sept. 27 and 28. The main attraction will be an aerial meet staged under the auspices of Utica Post, No. 229, American Legion. F. Trubee Davison, Assistant Secretary of War, has accepted an invitation to attend. Frank H. Wenner, Chairman of the Legion Committee in charge, has announced that a squadron of between 50 and 75 Army and Navy planes will participate. The progeam will include cross-country races, dead stick landings, bombing and balloon bursting contests.

Dedication of the new 1,600 x 162 ft. hard-surface runway at the St. Paul Municipal Airport was held Aug. 25.

Amarillo, Tex., will dedicate a new municipal airport during the week-end on Sept. 7-8, with an air derby.

The opening celebration of St. Catharine's Airport at Homer, N. Y., is planned for Sept. 13, 14, and 15.

An airport at Alexandria, Ind., was opened with an exposition on Sept. 1 and 2.

Denver Municipal Airport will be opened formally Oct. 4. A long fence has been constructed to keep crowds off of the flying field. Danville, Ill., Chamber of Commerce Airport will be dedicated Sept. 7-8.

Pan American Offers Air-Rail-Boat Cruise

NEW YORK (N. Y.)—Every week during the fall and winter, beginning Sept. 29, tourists from various parts of the United States may start on a twenty-day cruise by plane, rail and steamship through this country and the West Indies. These trips have been arranged by Pan American Airways in co-operation with twelve railroads and steamship companies. Passengers may start from any city east of the Mississippi on Sundays or Mondays, to reach Miami by rail Wednesday morning, from which point the air cruise begins. The round trip, including meals, hotels, and all incidentals, will cost $890.

The itinerary through the West Indies by air calls for stopovers at Havana, Camaguey and Santiago, Cuba, Port au Prince, Haiti, Santo Domingo and San Juan, Porto Rico. From San Juan the tourists will return to New York City by boat, and proceed by train to their original point of departure. Thirteen of the scheduled twenty days of the cruise will be spent touring the West Indies.

Maddux Carries 20,714 Passengers

LOS ANGELES (CALIF.)—Maddux Air Lines, with headquarters in this city, carried a total of 20,714 passengers during the first seven months of this year as compared with 14,214 passengers carried during all of 1928, according to a recent announcement. Passenger miles flown for this year to date total 3,597,762 as against 3,145,685 for the full year of 1928.

P.A.A. Opening Three Extensions of Lines

(Continued from page 549)

Lucia, Windward Islands; Port of Spain, Trinidad, Georgetown, British Guiana, Paramaribo, Dutch Guiana. Air mail postage between the United States and the Virgin Islands will be $.10 for each half ounce or fraction thereof.

In addition, Pan American Airways will co-operate with Pan American-Grace Company in the extension of the Cristobal Santiago, Chile, F.A.M. No. 9, which is 3,700 mi. down the west coast of South America; with an additional 750 mi. route across the Andes Mountains to Buenos Aires, on the East Coast. This service, to be started Oct. 14, will take 9 days, affording savings nearly two weeks on mail ordinarily shipped from New York by boat. Mailers in the United States, using air mail routes where practicable, can route their mail via Miami or Brownsville, and letters posted in New York by Sunday 6 p.m. will reach The Argentine capital the following Monday week.

To make these new services possible Pan American is adding one new plane every eight days to their fleet of 59 planes and amphibions. All the planes have been operating with perfect radio communication throughout flight. It is planned to include passenger service on all of the above linea as soon as adequate terminal and airway facilities can be completed.

N. Y. & Rio Making Progress

A survey of the route down the east coast of South America from Paramaribo through Para, Pernambuco, Bahia and Montevideo to Buenos Aires was made recently by Col. Ralph A. O'Neill, president of New York, Rio & Buenos Aires Line. This company, which holds exclusive air mail contracts with Venezuela, Argentina and Uruguay, and has a permit to operate its line along the coast of Brazil, expects to inaugurate a seven-day service from New York to Buenos Aires before the first of the year. This cuts eleven days from the fastest steamship time, and when night flying is made possible by the installation of beacons, the time will be reduced three days more. Tampa will be the American port of entry, and that city is planning to build a seaplane base. Ford tri-engined planes will be used between New York and Tampa, Commodore flying boats to Paramaribo, and Sikorsky amphibions from there to Buenos Aires.

Colonel O'Neill's company is also negotiating for contracts with the governments of Brazil and other South American countries for branch lines and other extensions of the proposed route. It will build a $100,000 hangar, restaurant and waiting room at Botafogo, ten minutes from the center of Rio de Janeiro. An exclusive lease for the use of the fifteen airports owned by the French Compagnie Generals Aeropostale has been secured, and the company has received government permission to operate along the 4,000 mi. Brazilian coast.

The Compagnie Générale Aeropostale is now operating several lines in this region, and the German-owned Condor Syndicate has conducted a regular mail and passenger service between Rio de Janeiro and Porto Alegre, Brazil, for two years without the loss of a single passenger.

Showing the drum and lever by which the cable is reeled up and how the mail pouch is brought into the cabin

Plan Air-Rail-Water Service

LOS ANGELES (CALIF.)—Plans for working agreement between the Panama Pacific Steamship line, Transcontinental Air Transport, Universal Air Lines, and participating rail lines for a standardized air-rail-water around-America passenger service, have been announced by W. F. Ohlson, Southern California manager of the International Mercantile Marine Company. It is planned to start the new service on Oct. 19, with the departure from New York of the passenger liner Pennsylvania for Pacific Coast points via the Panama Canal. The new service will make it possible to complete the 8,000 mi. trip from New York to Los Angeles via the Panama Canal and return in a total of 17 days elapsed time.

Air Mail Fatalities Decrease

WASHINGTON (D. C.)—Fatalities of airplane pilots in contract mail flying during the first six months of 1929 were only one to every 1,063,293 mi. flown, according to statistics compiled by the Aeronautics Branch. This is 50 per cent under the rate for the first half of 1928. During the six months period, 6,379,776 mi. were covered, almost equalling the total of 7,846,296 for the whole of 1928.

Use Adams Pickup On Regular Mail Line

YOUNGSTOWN (OHIO)—After making several practice flights, covering a space of several weeks, the Adams air mail pickup device installed at Lansdowne Field here became part of the Cleveland-Pittsburgh service, Aug. 30, when Cleveland and Pittsburgh flyers dropped and took on mail without landing. The pickups were made by Trowbridge Sebree, flying a mail plane from Cleveland, and Harry Sievers, a Pittsburg pilot. The demonstration was witnessed by postal, air transport, and city officials.

Dr. Lytle S. Adams of Spokane, is the inventor of the device which consists of a V-shaped trap built on the geound to catch a small bag as it swings from the speeding plane on the end of a 75-foot cable. The device attaches another bag to the cable as it leaves the trap. [It is the same device used on the S. S. Laviathan—ED.]

The new device, it is stated, will materially cut the mail schedules. The theory of the system is that one of the devices can be erected in a fairly clear spot near the post office of a city. The air mail plane can leave the airport, swoop down on the pickup device, haul the mail to a similar pickup device near the post office of the city at the other end of the line, and then go on to that city's airport. The air mail closing time could be delayed 15 min., a half hour or an hour.

San Francisco Gets Direct T.A.T. Connection

LOS ANGELES (CALIF.)—Transcontinental Air Transport passenger service direct to San Francisco was inaugurated Sunday, Sept. 1, when the route of the T.A.T. was changed so that planes fly from Kingman, Ariz., to Bakersfield, Calif., instead of to Glendale via the Cajon Pass as formerly. From Bakersfield the T.A.T. plane continues on to Los Angeles while passengers for San Francisco change to a Maddux plane and continue direct to the northern city. Present Maddux schedules have been so arranged that connections are assured both incoming and outbound passengers.

The present Maddux plane south from San Francisco leaves at 7:20 a.m. instead of 8:15 a.m. as formerly, and connects with the T.A.T. plane at Bakersfield at 9:40 a.m. While the T.A.T. planes continues east, the morning Maddux plane flies on to Los Angeles with the San Francisco to Los Angeles passengers, arriving at 10:45 a.m. The north-bound afternoon plane, which formerly left the Grand Central Air Terminal at 3 p.m., now departs at 4 and connects with the westbound T.A.T. plane at Bakersfield, taking on San Francisco passengers there and arriving at the northern terminal at 7:45 p.m. while the T.A.T. plane continues to Los Angeles, arriving there at 6:10 p.m.

FOREIGN ACTIVITIES

Air Recommendations Made at Amsterdam

AMSTERDAM (HOLLAND)—A number of important recommendations relative to international aviation matters were adopted at the meeting here during July of the International Chamber of Commerce. Included in the resolutions passed were: (1) That governments with as little delay as possible, convert into an international convention a draft prepared by the International Technical Committee of Experts on Air Laws relative to the problem of establishing unified regulations on the liability of the air carrier. (2) That governments in drafting and interpreting international conventions on air navigation should refrain from placing any barriers in the way of the international growth of commercial aviation or air traffic. It is further recommended that customs formalities be reduced to a minimum.

(3) That free airports be built in the principal international trade centers and that accommodations be made there for the loading, unloading and storing of goods, and that repairing, assembling and equipping of planes used in regular transport be made free of all customs duties. (4) That every encouragement be given to the development of international air mail plans, and that the decisions reached by the universal Postal Congress in London allowing modification of the Universal Postal convention relating to air mail be applied without reserve whenever the necessity arises. (5) That the various governments, particularly in Europe, and interested parties within those nations, foster direct negotiations between air transport companies and railroad concerns for the development of air mail projects. Urgent attention is called also to the matter of co-ordinated air and sea traffic which is of growing importance.

Mexico Boosts Air Routes

MEXICO CITY (MEXICO) — The Mexican Post Office Department is helping along publicity for the newly established air mail and passenger service between Mexico City and Tijuana, Lower California, by pasting posters in post offices throughout the Republic announcing that the service enables mail to reach Los Angeles, Calif., two days after leaving the Mexican capital. This line, which is operated out of here three times a week, places eighteen important Mexican cities on an air route. The service is conducted by the Latin American Air Transport company. Banks and other business houses in the larger cities of Mexico are also lending a hand toward stimulating interest in the country's air mail services.

Start South African Mail Line

CAPE TOWN (SOUTH AFRICA)—A new air mail service is being operated between this city, Port Elizabeth, Johannesburg and Durban in South Africa in co-ordination with the arrival and departure of mail steamships on the service to England. Almost two days time is saved in transmission of mail to Durban. The South African Government has been encouraging air mail and air transport services in recent months and much along this line is expected to be realized through the operation of a company similar to the National Flying Services, of England.

Metal Monoplane Is Built in Australia

MELBOURNE (AUSTRALIA)—With a design specially adapted to Australian requirements the "Lascoter" 5-6 passenger high-wing semi-cantilever all metal monoplane has recently been put on the market by Larkin Aircraft Supply Company, Ltd. A clearance of 8 ft under the wings, and an undercarriage with 13-ft tread together make possible safe landings in the scrub- or grass-covered land which forms such a large proportion of the country.

The new plane is so designed that it may be taken apart and re-assembled very easily. Front end, cabin, and rear end of the fuselage are built in distinct, easily detachable sections and the wings are also easily detachable. Special provisions for passenger comfort have also been made, such as adjustable ventilation, double thickness sound-resisting cabin walls and semi-pneumatic upholstery.

Fitted with a "Puma" engine the plane has a cruising speed of 80-90 m p h, and a range of about 600 mi. It has independent wheel brakes, and is otherwise very completely equipped, with many items optional according to the purchaser's preference.

Build Large English Flying Boat

LONDON (ENGLAND)—Following the recent test flights of the Dornier Do X over Lake Constance and the announcement of proposed construction of a huge flying boat by Herr Rumpler in Germany, it has been reported here that the Blackburn Aeroplane & Motor Company, Ltd., of Yorkshire, is building under secret Air Ministry auspices, a giant flying boat which will seat 50 persons and have a range of 1 000 mi without refueling. Construction is similar to the Blackburn Nile [described in the August 3d issue of AVIATION]. The new machine will be powered by three Rolls Royce engines.

Foreign News Briefs

The twenty-second meeting of the International Air Traffic Association, was held at the Hague Aug. 26-27 and was attended by delegates from 23 European air navigation companies.

An international show for light planes will be held at Paris September 23-30 under the auspices of the French Aero Club.

Plans are under consideration for a central airport at the present aerodrome at Staaken, accomodations to include a mooring mast for airships of the projected Berlin-Tokio and London-Australia routes, financial means to be provided by Germany, Prussia and Berlin.

Mlle. Lena Bernstein established a non-stop record for light planes in her recent flight of 1 562 mi. from Marseilles, France, to Sollum, Egypt.

The Western Australia Airways, Ltd., reports monthly traffic of 22 000 letters over its air mail routes.

Pilot Edzard claimed the world record for baby planes by covering the 995 mi. staked course in 13½ hr., near Bremen, Germany, on Aug. 20.

A trans-Atlantic Rohrback Romar flying boat was recently given a 15-hr. flight test by the Luft Hansa air lines over the British Isles and the Scandinavian peninsula.

The Southern Cross is being overhauled at the Amsterdam Fokker works for the proposed flight from Amsterdam to America.

The British Air Survey Company has just completed plans for surveying the upper reaches of the Nile, at a total cost of $199.075.

The pooling of the resources of the Irish Free State Army Air Post and the Commercial Air Service for mutual benefit was recently proposed.

Various municipalties in Twenthe the Dutch textile center, are raising funds for joint exploitation at Enschede of an airport. A site of 150 acres has already been secured.

Flying clubs are being organized at the Hague and Amsterdam which will include provision for instruction in aviation.

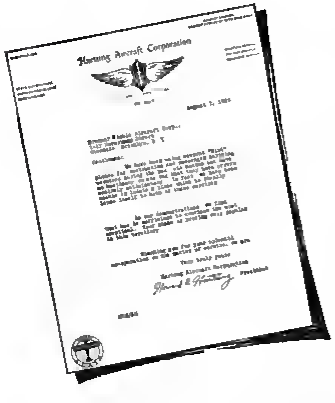
England's latest aircraft carrier, the Glorious, is nearing completion and will be assigned to the Mediterranean. England at the present time has two carriers with the Atlantic fleet two in the Mediterranean and one in China waters.

The Junkers "Bremen" type monoplane is being used in Germany for forest dusting.

The Imperial Airways tea flights over London are said to be proving unusually popular this season.

"BIRD"

Why they suit the DEALER!



Safety in Training—Speed in Transportation

DEPENDABILITY at all Times

THE MERE SELLING of a plane is NOT ENOUGH. Many times the sale depends upon instruction; often a sale is made to a newly qualified pilot. The dealer's problem is to sell the plane which will afford the quickest instruction and at the same time assure the new pilot of the highest degree of personal safety.

And again, to sell for transportation means the selling of speedy miles, ease of handling, and low cost of operation.

BIRD dealers are satisfied that these planes embrace the features of ALL THAT CAN BE DESIRED IN THE FINEST OF AIRCRAFT.

"MORE PERFORMANCE PER HORSEPOWER"

BIRD

PLANES

Why they suit the FLYER!

1. Chrome molydanum tubing throughout.
2. Inherent stability perfected to a degree which allows fool-proof student training.
3. Dual control with front unit quickly detachable for passagar carrying.
4. Perfection in aileron design.
5. Wing design perfected aerodynamically to a degree which permits performance comparable to slotted wings.
6. Landing gear of split axle type with combination oleo and rubber shock absorbers.
7. Metal turtle deck from front to rear allowing internal inspection.

WHEN a BIRD pilot gives her the throttle he knows that he can OUTSPEED any other ship of the same horsepower.

When he hovers over a small field he knows that he can LAND SAFELY—and GET AWAY with EASE.

When he takes a passenger—whether for hire or as a guest—he knows that his passenger is afforded the HIGHEST DEGREE OF SAFETY.

When he lands in a strange field he need not apologize for his plane, because he knows that he has just brought in the GREATEST PERFORMER PER HORSEPOWER.

Confidence and pride are manifested in the satisfaction with which the pilot regards his BIRD.

BRUNNER-WINKLE AIRCRAFT CORPORATION

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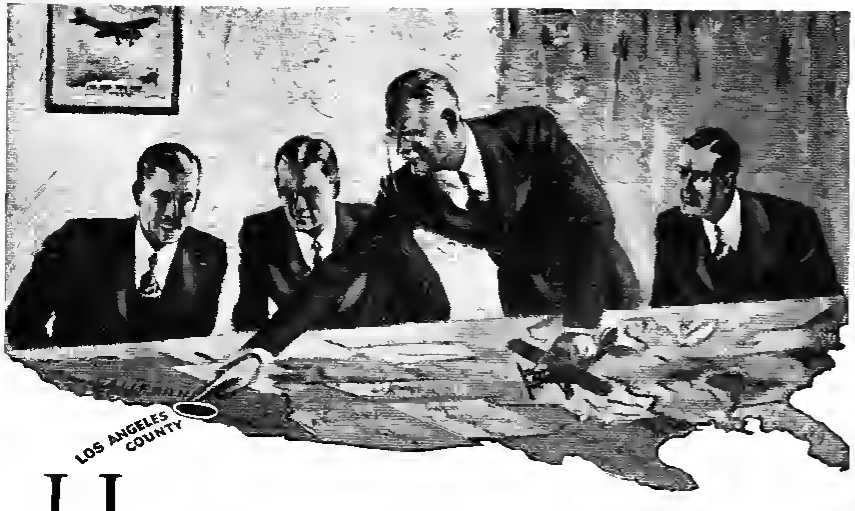
BIRD



HERE, GENTLEMEN, *is the Ideal Spot in all America for the* Aircraft Industry

The remarkable industrial growth of Los Angeles County may be attributed to:

Natural year 'round climatic advantages

Tremendous population growth

High per capita buying power

Abundance of contented labor

Low building costs

Low cost power

Largest concentrated market on Pacific Coast

Splendid transportation facilities

Economical access to Pacific Coast and export markets

Flying conditions are as nearly ideal the year 'round in Los Angeles County as anywhere in America.

U. S. Weather Bureau reports over the last 50 years show an average wind velocity of 5 miles per hour . . . . 355 days per year with sunshine . . . . 274 days per year when the temperature is neither above 80 nor below 40.

17 manufacturers of airplanes and 9 manufacturers of airplane motors have already located here.

There are 25 or more aviation schools, 2200 aviation students, and more than 3,000 pilots in Southern California.

6 passenger transport companies operate 11 regularly scheduled lines out of Los Angeles, which is the terminal for 4 air-rail and 2 air-mail lines.

These are facts which the manufacturer of aeroplanes, motors or parts can turn to his profit . . . for these conditions have a tremendous effect on production costs and successful operation . . . . and they are not paralleled elsewhere in America.

Air-Minded LOS ANGELES COUNTY

Complete detailed surveys and information supplied, upon request, by INDUSTRIAL DEPT.—LOS ANGELES CHAMBER OF COMMERCE

The COMFORT *of a* CABIN CRUISER . .

Flying over Land and Water

Perfected* IRELAND AMPHIBION . . . *most modern of all Air-Yachts

CONSIDER the surprisingly comfortable five-place "Neptune" . . . an all-weather Air-Yacht . . . it carries you quickly and surely at any time of year to any destination on land or water.

The large, commodious cabin is complete in every detail of appointment . . . and it's so quiet that you can talk in conversational tones. The adjustable, unbreakable glass windows give perfect light and vision . . . or to those who enjoy the thrill of flying in the open air the Neptune comes with open cabin.

In all-around performance the perfected "Neptune" is the highest expression of Amphibion construction. Combining exceptional manoeuverability—strength—flexibility—excess power, and ease of control . . . its economy of operation and low upkeep cost are strong factors in its rapidly growing popularity.

Remember, too, in a Neptune or any one of Curtiss's wide range of planes, you will find country wide service and accommodations. For Curtiss has blanketed the airways and waterways of the country with 40 branches and 85 dealers.

The Neptune lands easily and rises quickly from land or water

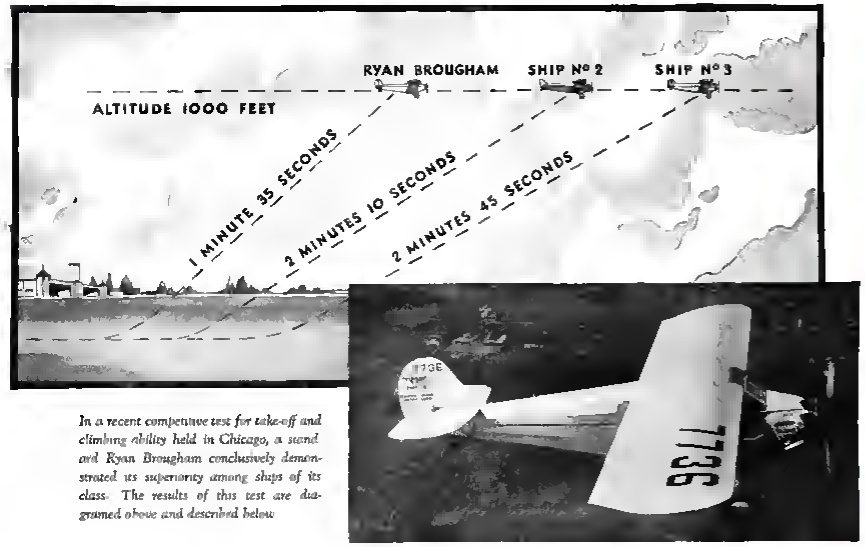
Write or call at "Aviation Headquarters," Curtiss Flying Service, Dept O, 27 West 57th Street, New York City, and let us tell you immediately the nearest Curtiss Branch. There you can arrange to fly the Neptune . . . subject it to every test you want, and learn first-hand its true distinction.

Sales agents for Curtiss Robertson Airplane Mfg. Co., Cessna Aircraft Co., Curtiss Aeroplane and Motor Co., Incorporated, Ireland Aircraft, Incorporated, Command-Aire, Inc., Moth Aircraft Corporation.

CURTISS FLYING SERVICE

"World's Oldest Flying Organization"

FOR TAKE-OFF AND CLIMB —BEST INSURANCE IS A RYAN



In a recent competitive test for take-off and climbing ability held in Chicago, a standard Ryan Brougham conclusively demonstrated its superiority among ships of its class. The results of this test are diagramed above and described below

CARRYING six people and 100 gallons of gasoline, a standard Ryan B5 Brougham took off from a Chicago Airport and climbed to an altitude of 1,000 feet in 1 minute and 35 seconds.

Ship No 2, in competition with the Ryan, carried six people and 97 gallons of gasoline and required 2 minutes and 10 seconds to take off and gain a height of 1,000 feet.

Ship No 3, with load of six people and but 85 gallons of gasoline, took off and reached 1,000 feet altitude only after 2 minutes and 45 seconds.

This marked victory of the Ryan Brougham—not in a "trick" demonstration, but in a competitive test with an impartial buyer as judge—furnishes further proof that the Ryan will outperform all other ships of equal load and power.

Powered by the new Wright 300 H. P. J6 Whirlwind motor—with installation properly related to the ship's design—today's Ryan will take off fully loaded in 275 feet, and in 8 seconds time, will climb at the rate of 1200 feet a minute, and will land in a 200 foot circle. It provides top speed of 140 miles per hour and cruising speed of 120 miles per hour. Crusing radius is 700 miles

Write for illustrated catalog describing details of Ryan design and construction. Learn why Ryan's performance and safety records are unexcelled by ships of its class.

RYAN AIRCRAFT CORPORATION
Division of
DETROIT AIRCRAFT CORPORATION
Lambert—St Louis Airport
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RYAN

SISTER SHIP OF THE "SPIRIT OF ST. LOUIS"

Department of Commerce Approved Type Certificate No. 142, including land gear and pontoons

FULL 100 HORSEPOWER

KINNER
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GLENDALE, CALIF.

RUSSELL "Lobe" PARACHUTE

The Russell "Lobe" Parachute fits right into the seat—and this new detachable BACK-PAD holds the harness in position while forming an additional cushion for greater comfort

You fasten and unfasten the parachute harness while you are seated in the cockpit—in the same manner as you snap the safety belt. It's all very simple and practical——. An indication of the many other refinements you will find in the Russell "Lobe" Parachute

Famous flyers, air transport companies, training schools, individual flyers and aerial passengers the world over have adopted the Russell "Lobe" Parachute as standard flight equipment.

In an emergency you simply pull the release ring —the Russell "Lobe" Parachute does the rest .....It has a record of 100% efficiency in use!

Veteran air men prefer this aerial life-saver because it has no springs, no rubber-bands, no pilot chute—nothing to deteriorate, nothing to get out of order.

Ask about the new Russell "Lobe" Pongee Silk Parachutes, selling at $275. Other Models, $250 to $350.

Descriptive Folder and Name of Nearest Service Station and Dealer on Request.

Russell Parachute Company
4202 Kettner Blvd. San Diego, California

Eastern Sales Office: 122 E. 42nd St., New York City

Holes are punched into cap strips of ribs; fabric is applied; a duralumin washer laid over each hole and Self-tapping Screws turned in. Then round fabric patches are doped over the screwheads.

A new method of attaching fabric

Consolidated Aircraft develops this secure, quick and easy way of fastening fabric to the metal ribs of the FLEET biplane . . .

The design of the FLEET biplane made it impractical to attach fabric to the metal ribs of the wing and tail surfaces by the usual cord-lacing method. A new way had to be found. Consolidated Aircraft engineers tried Hardened Self-tapping Sheet Metal Screws, which proved to be an ideal means of effecting the desired results. Not only did these Screws assure secure fastenings but they provided an easy, quick and economical method.

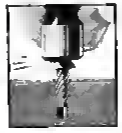
This is but one of the many assemblies for which Hardened Self-tapping Sheet Metal Screws and Hardened Metallic Drive Screws have been adopted by prominent aircraft manufacturers.

These unique Screws eliminate costly tapping operations . . . speed up production . . . cut the cost of making fastenings. And, in some instances, they have made possible simplification and improvements in aircraft design.

We suggest a test of these Screws on your own work. See what they will do . . . what they can save you. A brief description of assemblies to which you think these Screws adaptable brings suitable samples, free.

HARDENED SELF-TAPPING SHEET METAL SCREWS

For making sheet metal assemblies Turn the Hardened Self-tapping Sheet Metal Screw into a pierced or drilled hole. As the Screw is driven, it cuts its own thread in the metal like a tap, drawing sections securely together



HARDENED METALLIC DRIVE SCREWS

To make permanent fastenings to iron, brass and aluminum castings, steel, Bakelite etc. Hammer the Hardened Metallic Drive Screw into a drilled or formed hole. The Screw taps a thread in the material, and makes a fastening that stays secure even under constant vibration and severe service.

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PARKER-KALON
HARDENED
Self-tapping Screws

KILL FIRE WHILE IT IS YOUNG

We know how to protect your airport against fire!

A proud tri-motor singing its way into the clouds. A hangar squat over a group of planes. A field that cost money, time and effort. Precious carriers with more precious cargoes all cry for the fullest fire protection that you can give.

Whatever the size, location or importance of your airport—there is available a *right* type of American-LaFrance and Foamite fire protection for it. From small hand extinguishers to the most powerful motor fire apparatus—from a single extinguisher to the most elaborately complete system, American-LaFrance and Foamite products are ready to bring correct protection to your airport. With such a comprehensive line, therefore, our advice can be absolutely unbiased—based only on the best interest of your airport.

A booklet "Sinister Beacons" describes the protection of airports against fire.

A free copy is yours upon request. American-LaFrance and Foamite Corporation, Engineers and Manufacturers, Department T 53, Elmira, New York.

American-LaFrance and Foamite Corp., Dept. T 53, Elmira, N. Y.

☐ Please send me your booklet "Sinister Beacons."

☐ Please have a Fire Protection Engineer call.

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Town or City .....

State .....

AMERICAN-LAFRANCE AND FOAMITE PROTECTION

A Complete Engineering Service For Extinguishing Fires

SOCIÉTÉ LORRAINE

200 ROUTE DE BEZONS
A ARGENTEUIL. (S.&O.)

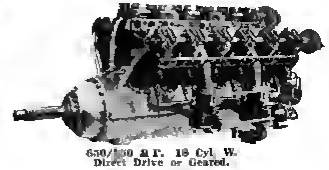
TÉLÉPHONE
WAGRAM 99 87

REG. COMMERCE
SEINE N° 111·677

400/410 H.P. 12 Cyl. V.

450/500 H.P. 12 Cyl. W.
Direct Drive or Geared

480/510 H.P. 12 Cyl. W.

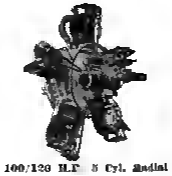


650/700 H.P. 18 Cyl. W.
Direct Drive or Geared.

MOTEURS D'AVIATION

LORRAINE

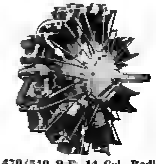
660/730 H.P. 12 Cyl. W.
Direct Drive or Geared.



100/120 H.P. 5 Cyl. Radial

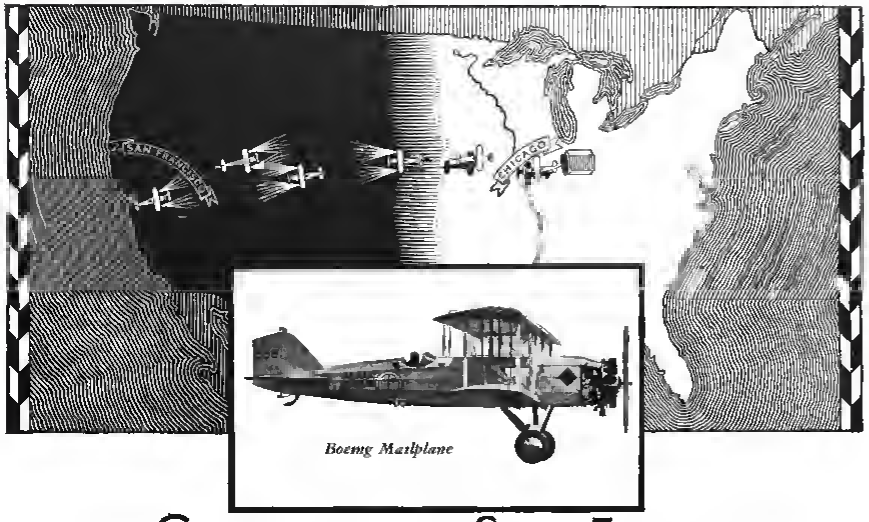
240/270 H.P. 7 Cyl. Radial

240/270 H.P. Geared



470/510 H.P. 14 Cyl. Radial
Direct Drive or Geared

Marine Motors of 250 and 500 H.P.
Automobiles 15 H.P. Sport and Touring Models



Boeing Mailplane

FROM CHICAGO TO SAN FRANCISCO
with the Boeing!

FROM sea level to altitudes of more than 14,000 feet . at temperatures ranging from 135 above to 50 below zero . . . through desert heat and over snow-capped mountains, Boeing planes wing their way, every day of the year, from Chicago to San Francisco Bay.

It is significant that the Boeing designers have relied so largely upon Aluminum and its strong alloys in creating ships to meet this arduous service—to increase the lifting load per horsepower—and to insure the factor of safety.

It is significant also that the Boeing Airplane Company, operating one of the largest airplane factories in the United States, should turn to Aluminum Company of America as its source of supply of sheet, tubes, bars, forgings, castings, rivets, and screw machine parts, made from Aluminum and its alloys.

Technical knowledge of the application of these products to aircraft design and complete equipment for their manufacture is at the service of the aircraft industry. Inquiries are invited.

Aluminum Company of America
2482 Oliver Bldg. Pittsburgh, Pa.
Offices in 19 Principal American Cities

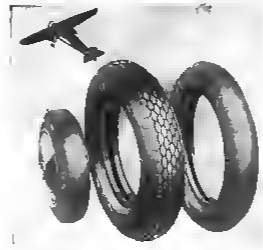
These parts of the Boeing Mail Planes are fabricated from Aluminum and its alloys:

tail pit lining
body fairing
fire wall between motor and pilot seats
lining for bottom
cowling
decking
walk ways
channels
ribs and beams
longerons and struts
wing stream lining
disc wheels
brake shoes
leaving and trailing edges
conduit for control wires
propellers
nose section
crank case
diffuser section
accessory drive housing
cylinder heads
pistons
gas and oil tanks
standpipes in gas tanks
seats and chairs
instrument board
rivets
screw machine parts
rudder
fin
stabilizers
elevators
* * *
also parts of
fuselage frame
fuselage covering
structural shapes
angles
gusset plates
throttle handle control
control fittings and
strut terminals

ALCOA ALUMINUM AND ITS ALLOYS FOR AIRCRAFT ALCOA

Lindbergh's Ryan Monoplane, "Spirit of St. Louis", was equipped with Goodrich Silvertown Tires. At the second All American aircraft show in Detroit last April the new Ryan was also equipped with Goodrich Split Second Silvertown Tires.

SPLIT SECOND SILVERTOWNS
Across the Sea



The three Goodrich Silvertown Airplane tires. Tail Wheel. Non skid. Smooth tread

ON that dull grey morning in May, 1927, when Colonel Lindbergh grazed the telephone wires and turned out across the sea, another chapter was added to aviation's voluminous book.

"I was fitted out with a perfect ship, equipped by men who took every care and precaution," he said in an article appearing in the *New York Times*. "Nothing was overlooked—I had the pick of everything in the way of equipment."

Goodrich is rightfully proud of the fact that the "Spirit of St. Louis" was equipped with Split Second Silvertown Airplane Tires.

Since that time Ryan Monoplanes have flown away from the B. F. Mahoney Aircraft Corp. factory equipped as Lindbergh's plane was equipped . . . with Goodrich Split Second Silvertown Tires.

Goodrich Silvertowns are made strong enough to withstand the *heaviest* take-off overloads, yet they are *light* enough to permit the carrying of *three extra gallons of gas.*

* * *

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ont.

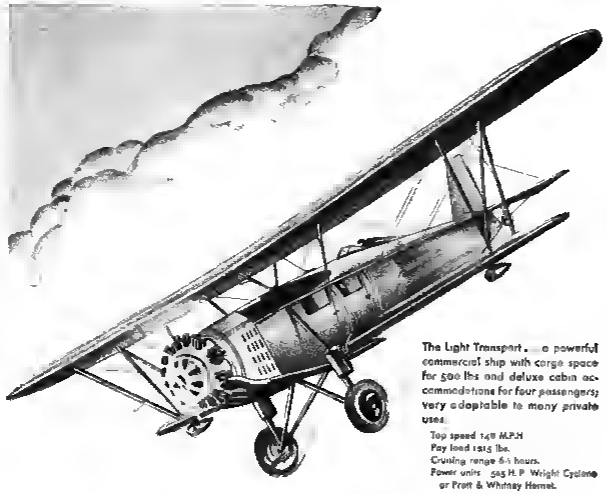
SPLIT SECOND SILVERTOWNS — MANY WORLD RECORDS HAVE *PROVED* THESE TIRES

Brock and Schlee's Stinson | Dole Derby Goebel's Travel Air | Dawn-to-Dusk Hawks' Lockheed | Kingsford Smith's Fokker | Chamberlin and Levine's Bellanca

Goodrich *Rubber for Aviation*

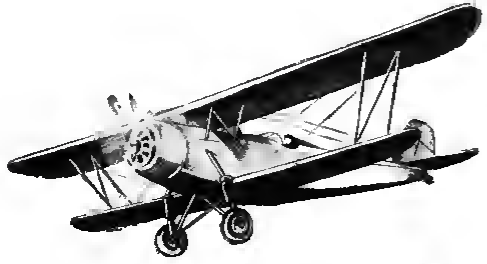
THE design, workmanship and inbuilt safety that have been characteristic of Stearman in the past are even more pronounced and outstanding in these 4 new models. However exacting your demands for transportation may be, you will find a Stearman to meet them safely, comfortably and economically.

THE STEARMAN AIRCRAFT COMPANY
WICHITA, KANSAS



The Light Transport . . . a powerful commercial ship with cargo space for 500 lbs and deluxe cabin accommodations for four passengers; very adaptable to many private uses.

Top speed 140 M.P.H.
Pay load 1215 lbs.
Cruising range 6½ hours.
Power units 525 H.P. Wright Cyclone or Pratt & Whitney Hornet.



The C-4A . . . a high speed sport plane adaptable to various commercial uses.

Top speed 153 M.P.H.
Pay load 600 lbs.
Cruising range 5½ hours.
Powered with Wright J-6 300 H.P. Whirlwind 9 or Pratt & Whitney Wasp on special order.

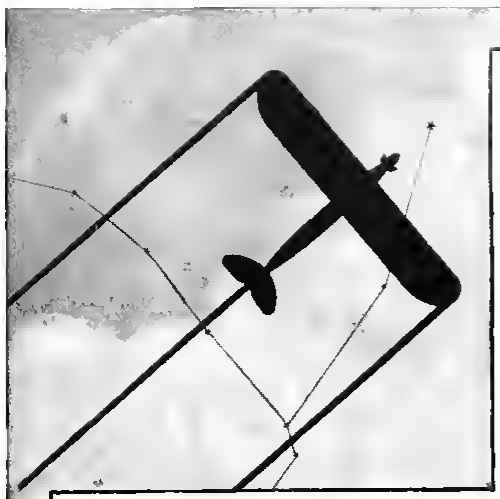
4 NEW STEARMANS APPEAR OVER THE HORIZON

The Speed Mail . . . a fast, efficient cargo ship with 91 cu. ft. of cargo space.

Top speed 147 M.P.H.
Pay load 1000 lbs.
Cruising range 6 hours.
Power units 525 H.P. Pratt & Whitney Hornet or Wright Cyclone.

The C-3R . . . an outgrowth of the popular C-3B . . . a new Stearman to accommodate the Wright J-6 225 H.P. Whirlwind 7.

Top speed 138 M.P.H.
Pay load 400 lbs.
Cruising range 5½ hours.



WHO BUYS PLANES ANYWAY?

Last year this country produced almost 4000 commercial planes. During the first six months of 1929 nearly 3000 commercial planes have been sold. There are plenty of money-making opportunities in the sale of commercial planes.

To a limited number of men possessing moderate capital, Colonial Flying Service offers such an opportunity—exclusive agencies in New York State and New England for Fleet, Fairchild, Challenger, Pitcairn and Standard planes.

▲ ▲ ▲

The advantages of a Colonial franchise are found in the answers to the three questions you would ask, no matter what agencies you might be considering. 1. Who buys planes, anyway? 2. Do the planes meet the demands of this market? 3. Who is the company granting the franchise and to what extent can it be helpful in marketing the planes?

1. The market for the sale of planes consists of (a) Training schools and student fliers, (b) Business organizations, (c) Private owners, and (d) Operators for charter service and passenger hopping.

2. The following are the specifications of the planes for which Colonial franchises are offered: FLEET—Model 1, Price $5485 F. A. F. Model 2, Price $4985 F. A. F. A development of the training plane used by the Army, Navy and Marine Corps. A splendid instruction ship. Dual control. Warner "Scarab" 110 H. P. or Kinner 100 H. P. motor. CHALLENGER—Model KR 21A, Price $4685 F. A. F. A tapered wing, two-place plane for the private owner. A small, fast sport ship. Dual control. Kinner 100 H. P. motor. CHALLENGER—Model KR 34A, Price $6575 F. A. F. An ideal three-place fast open plane for cross-country flying. Dual control. Wright J6-165 H. P. motor. Brakes. PITCAIRN—Sport Mailwing. Price $8500 F. A. F. The last word in design refinement and sturdy construction. A three-place open plane. Dual control. Wright J5-225 H. P. motor. Very fast. Brakes. FAIRCHILD—Model 71, Price $18,900 F. A. F. A cabin plane for pilot and 6 passengers. Ideal for charter operation and for business concerns. Wasp 425 H. P. motor. STANDARD—Model D-25, Price $9750. A five-place open plane for passenger hopping from all types of fields. High load capacity. Quick take-off. Low landing speed. Removable dual control. Wright J5-225 H. P. motor. Brakes.

How well these planes cover the market may be judged by this partial list of owners: Donald Woodward, LeRoy, N. Y., FLEET dealer. Has bought 5 ships, 4 are being used for instruction. One has been sold to Wm. Sloan, Rochester, N. Y. Lenllard Spencer, Newport, R. I. owns a ship for personal use. Danbury Aero Club, Danbury, Conn. Purchased a biplane for private instruction. Newport Air Transport, Newport, R. I. Purchased a five-place open plane for passenger hopping. H. & H. Aerial Services, Inc., West Haven, Conn. Bought two biplanes for student instruction. Harris Whittemore, Jr., Naugatuck, Conn. Purchased a biplane for experimental work.

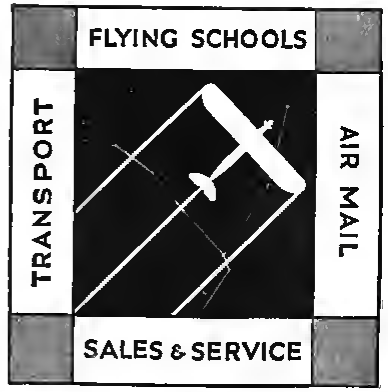
3. Colonial is identified with the earliest operation of the Air Mail. Contract Air Mail Routes 1 and 20, and Foreign Air Mail Route 1 are all operated by Colonial companies. Passenger Transport Lines between New York and Boston, New York and Montreal and Buffalo and Toronto are a part of the Colonial System. Colonial Flying Schools are maintained in New York State and New England.

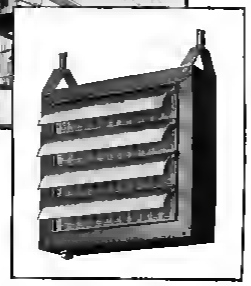
With this background Colonial is able to advise its dealers on all subjects connected with the operation of a successful sales agency. A Colonial franchise covers not only ships but everything pertaining to their operation and maintenance. Affiliation with an established flying field can be arranged. Write for territories available and conditions for securing an agency.

COLONIAL FLYING SERVICE INC.

DIVISION OF AVIATION CORPORATION
270 Madison Avenue, New York City

District Sales Offices—BOSTON, BUFFALO, HARTFORD, SCHENECTADY





Put Trane Unit Heaters in the Hangars

Trane Unit Heaters provide comfortable and economic heating of large spaces by directing heated air down to the floor where it spreads out and blankets the entire area. Gradual rise of the heated air gives proper temperatures throughout the hangar. A minimum amount of heat is lost through the roof. Trane Unit Heaters also provide year round healthful ventilation.

Aside from an actual saving in fuel. Trane Unit Heating costs less than cast iron radiation and provides far superior heating.

Trane Unit Heaters are unique. The patented heating element made without soldered, brazed or welded joints, is built to give years of trouble-free service.

You can install Trane Unit Heaters in your present system to correct deficiencies in heating. A complete change over is most profitable in the long run. *Mail the coupon for complete information.*

HEAT WITH UNIT HEATERS

HEAT CABINETS **TRANE** CONCEALED HEATERS
PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

THE TRANE COMPANY, Dept 7,
298 Cameron Ave., La Crosse Wis.
Send complete information on Trane Unit Heating Systems.
Name ..... Position .....
Company .....
Address .....
City ..... State .....

Now! You Can Drive Screws to Any Pre-determined Tension With

Thor ELECTRIC SCREW DRIVERS

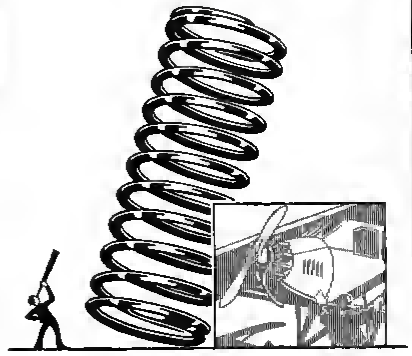
The Thor Double Slip Clutch Screw Driving Attachment is a patented feature which has greatly increased the advantages of Thor Electric Screw Drivers. It has enabled manufacturers who have delicate screw driving problems to take advantage of the high production possibilities of Thor Screw Drivers.

This attachment can be set to drive screws to any pre determined tension. When the screw is driven to the tightness desired, the auxiliary clutch will automatically slip. This eliminates stripping of screw or material and it is not necessary to rely upon the judgment or experience of the operator.

An investigation or free trial in your plant under your own conditions will convince you that Thor Electric Screw Drivers will reduce your costs.

TOOL MAKERS SINCE 1893

INDEPENDENT PNEUMATIC TOOL CO.
PNEUMATIC TOOLS — 232 So. Jefferson St. Chicago Ill. — ELECTRIC TOOLS



DEPENDABLE

---as to test

---in meeting difficult or fussy requirements

---in being up to specifications

---in service

---in meeting ever-changing delivery schedules

---as to speed for experimental work

May we figure on *your* requirements?

THE WALLACE BARNES CO.
BRISTOL, CONNECTICUT

Barnes made SPRINGS
COLD ROLLED SPRING STEEL SPRING WASHERS ASSEMBLIES — SCREW MACHINE PARTS SMALL STAMPINGS

This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial worthy

Squelching another whispering campaign—

"Look out for that company, it's slipping," said the whisperers. Its product, an assembled unit sold to manufacturers to build into their machines, was of high quality but had been sold only through salesmen and direct mail.

Sales *were* falling off. The market, conscious of the gossip, was suspicious of the financial strength of the seller. This increasing sales resistance was undermining the morale of the sales staff.

With this serious situation facing it, the company called in an advertising agent who recommended an emergency advertising campaign in a McGraw-Hill publication covering the particular market. The program, the first publication advertising ever used by this company, consisted of color spreads in every issue.

That was only a year ago. Today, as evidence of the company's comeback, sales are not only mounting but the advertiser's chief competitor has offered to sell out to the new advertiser. *From bottom place to top position in recognition in one year.*

MORAL: Selling is not a choice between salesmen, publication advertising and direct mail but a matter of co-ordinating all three and using each on a basis of the job to be done

M c G R A W - H I L L
P U B L I C A T I O N S

New York Chicago Cleveland Detroit Philadelphia St Louis
Greenville San Francisco Boston London

P-15

AIRCRAFT SERVICE DIRECTORY

See our Advertisement
on the back cover of August III
PIONEER INSTRUMENT COMPANY
254 LEXINGTON AVE. BROOKLYN NEW YORK

AVIATION PROTECTION Inc.
INSURANCE BROKERS TO AVIATION
110 WILLIAM STREET
NEW YORK

TRIUMPH
MAGNETIC
FUEL GAGES FOR AIRCRAFT
NEW MODELS FOR COWL, WING, OR SPECIAL TANKS
Manufactured by
The Boston Auto Gage Company
PITTSFIELD MASSACHUSETTS

Distributors of
Flightex Fabric
Crystal Clear Dopes
Supreme Propellers
Haskelite Plywood
B G and A. C. Spark Plugs, etc.
We carry a complete assortment of Aeronautical parts and supplies; maintain a cylinder service department; shipments made the same day order is received. Get our prices on Dopes.
JOHN S. COX AND SON
222 22d So. 7th st. Terre Haute Ind

Actual Size
SEND
ONE DOLLAR
We will send you by return mail a beautiful pair of sterling silver wings mounted on bar pin with safety catch also identification card issued by National Pilots Assn. These pins are being worn by thousands of aviators aviation mechanics and boosters
Illustrated booklet describing Davenport's large Airport and school mailed with each order
Iowa-Illinois Airways Inc.
Davenport Iowa

SEAMLESS STEEL TUBING
Made in Aircraft Specifications 10235 D
Warehouse stock also mill shipment.
The Cleveland Tool & Supply Company
1427 1437 West Sixth st Cleveland O

AIRPLANE SPRUCE
Rough Green Kiln Dried Rough-Air Dried or Finished to your sizes. Prompt shipments in carloads and less than carloads. We supply many of the largest manufacturers in the United States and Europe.
specialists in Airplane Spruce for Fifteen Years
J. Y. G. POSEY & COMPANY
Public Service Building PORTLAND ORE.

OX-5 SPECIALISTS
Wonderfully complete line of parts for OX motors at attractive prices. Also general utility material and accessories. Cylinder repairing. Send for 1929 Catalogue No 7
MONUMENTAL AIRCRAFT, INC.
435 Equitable Bldg Baltimore, Md.

PITCH & BANK INDICATOR
Your Position at a glance
Booklet "RICKER Navigating Instruments" sent on request.
RICKER INSTRUMENT COMPANY
1811 Fairmount Ave. Philadelphia Pa.

Burgess Norton Perfection Piston Pins for the following makes of motors are stocked by Automotive Jobbers everywhere
Curtiss OX 5
Curtiss OXX-6d
Wright } J-4 J-5
Whirlwind
U S A Std
Liberty
THE BURGESS NORTON MFG. CO.
529 Peyton St. Geneva Ill

HANGARS
Fireproof steel hangars
Erected anywhere
Send for catalogue No 110
AIRPORT HANGAR
Chatham Phenix Bldg
Long Island City N Y
Eastern Representatives of
INTERNATIONAL STEEL and IRON CO
Evansville, Indiana, U S A

Distributors Travel Air Aeronca Avian Keystone Loening
(affiliated Wright Dealer and Service Station
AIRCRAFT CONSTRUCTION
Complete and modern Repair and Rebuilding Facilities. High class work. Immediate attention to Metal, Wood, Covering, Painting and Welding
Ludington Philadelphia Flying Service, Inc
Operators of the Philadelphia Airport.
City Office—810 Atlantic Bldg. Philadelphia

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Before disclosing your invention to anyone send for free blank form "EVIDENCE OF CONCEPTION" to be signed and witnessed
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PLYWOOD
Used by every important builder. Recognized as the standard plywood for airplane construction. Over 50 applications. Blue print data book on request.
HASKELITE MFG. CORPORATION
120 S. LaSalle Street Chicago, Illinois

OX5 Cylinders
Reground and fitted with new pistons, wrist pins, rings, valve seats and valve guides. Also & OX5 crank shafts reground. Main bearings rebabbited. Line bored and di
KEMP MACH CO
Muncie, Ind

PITCH INDICATOR
Adjustable Zero
Readable at a Glance
Booklet on Request
Frisbie Aircraft Products
Box 389, New Haven, Conn

STEARMAN, D. H. MOTH AND MONOCOUPE
GEO. A. WIES, Inc.
Hangar and Office Garden City
Roosevelt Field 2 New York

Consult the
"Professional Service" Directory
and the
"Where To Fly" Section
on
Page 58

FLOTTORP
The Standard of Aircraft Propellers for Twenty Years
THE
FLOTTORP PROPELLER COMPANY
Grand Rapids Michigan

Send for Catalog
32 STYLES
AVIATION
GOGGLES
Made of Glass
Strauss & Sweet

WHERE TO FLY

ALABAMA

MONTGOMERY SCHOOL OF AERONAUTICS
MONTGOMERY AIRPORT
1500 Arrest
Montgomery, Ala.

Save money and learn to fly with us where climatic conditions permit daily instruction, thus permitting you to complete the course in one half the time required in other sections of the country.
Send for our literature

CALIFORNIA

AIRTECH SCHOOL OF AVIATION
LINDBERGH FIELD, SAN DIEGO, CALIFORNIA
Send for Complete Information

Department of Commerce Approved Transport Ground & Flying School

LEARN AVIATION with RYAN

The RYAN School that gives COMPLETE quality training. Specializing in Dual, Solo Ground & Air courses producing experts and commercial pilots.
Own Ships but perfect flying weather year 'round. Ground conference flying activities of any city in the United States.
B Means Something Other Ryan Graduates
Send for Prospectus Catalog.

T. C. RYAN FLYING SCHOOL
SAN DIEGO, CALIFORNIA

Western College of Aeronautics
154 W. Stanton Ave.
Los Angeles, Calif.

One of the finest technical and practical air courses in the world

Engineering Designing Flying

The Western Course equips you for positions of executive capacity

Licensed Pilots — Send for catalog

CONNECTICUT

FLYING SCHOOLS — AIR TRAILS — TRANSPORT SERVICE — SALES & SERVICE

L & H FLYING SCHOOL
Hartford Airport—at Hartford, Conn.
PART OF THE **COLONIAL** FLYING SYSTEM

ILLINOIS

FLY WITH US

We design and build our own airplanes. There is a saving of over $1,000 on every airplane we build which enables our members to fly at the lowest rate in Chicago.

Part of your ground schooling in working on Club airplanes which are always under construction in the Club workshops.

If you are interested in getting a complete ground schooling, and flying various types of ships call and see us or write for information.

Dual instruction $10.00 per hour
Solo $5.00 per hour

Edgewater Flying Club, Inc.
5418 Montrose Avenue Chicago, Ill.

STINSON FLYING AIRPORT SCHOOL

"Where the best pilots are trained"

3006 Pure Oil Bldg. Chicago, Ill.

CONTINENTAL

Investigate our Finite Training School—Unit Method—pay as you go—Air Corps System—No time ground course—our own field to fly from.

CONTINENTAL AIR SERVICES
Incorporated
2420 South Parkway Chicago

Learn to Fly at a Midwest Airways Corporation School
Under the direction of John O. Livingston
Three large Airports in the central west—at Aurora, Ill. Monmouth, Ill. and Waterloo, Iowa. Our ten training students to be become we lead pilots for the planes we sell. Largest distributors of commercial aircraft in the central states.
MIDWEST AIRWAYS CORPORATION
Wacо and Ryan Oairthntors

LEARN TO FLY
at
SKY HARBOR
on Chicago's North Shore
"Fleet" Training Planes Licensed Pilots
Reasonable Prices — Terms if desired.
GRAY GOOSE AIR LINES, Inc.
105 West Adams St., Chicago

MASSACHUSETTS

Cape Cod Glider School
American Motorless Aviation Corpn.
Solo Flying Juniors 14-17 Seniors 17-70
The German Course in America
Attractive summer camp rates. Write
SOUTH WELLFLEET, MASSACHUSETTS

MARYLAND

LEARN TO FLY
at "The Flyer's Paradise"
DEL-MAR-VA — FLYING SCHOOL, INC.

DEL-MAR-VA. AIRPORT
Ocbron, Md.

Four way field. 235 acres. The largest and most modern equipped airport in the East, where flying conditions are ideal all year around school. Instruction under personal supervision of U. S. Licensed Transport pilots of New American Eagle, Challenger and Fairchild planes with OX5 and radial motors. Students may obtain room and board on the field or within walking distance. Del Mar Va. Flying School Inc., Ocbron, Md.

MICHIGAN

LEARN TO FLY IN DETROIT
modern planes used — every student a booster
AMERICAN
write
HARRY ANDERSON
2125 David Stott Bldg. Detroit, Mich

Complete Air and Ground School
TRAVEL AIR AND STINSON PLANES
EXPERIENCED INSTRUCTORS
FURNITURE CAPITAL AIR SCHOOL
701 Michigan Trust, Grand Rapids, Mich.

MISSOURI

PARKS AIR COLLEGE

Complete flying and ground courses under Transport pilots. New Travel Airs with OX5 whirl wind and Curtiss Seagull motors. Write for free copy of Skyward Ho! our profusely illustrated catalog.

PARKS AIR COLLEGE
204 Ms. Theo Bldg.
St. Louis, Mo

NEW JERSEY

AIRVIEW FLYING SERVICE, Inc.
Red Bank New Jersey
Wacо and Fairchild Aerial Taxi Service in Any Point. Flying School Operated from the Finest Field in the Jersey Coast.
Hangar Space at Reasonable Rates

WHERE TO FLY

NEW JERSEY

IF YOU WANT TO LEARN TO FLY

It will pay you to visit Newark Air School—one of the finest air schools in the East—before making your choice. Capt. J. O. Donaldson and Maj. R. L. Cossey in charge. Twelve new planes. Elementary and advanced courses. Write for details.

NEWARK AIR SERVICE
INC.
NEWARK METROPOLITAN AIRPORT
Newark, N. J. Tel. Mulberry 1310
35 minutes from New York City

NEW YORK CITY

LEARN TO FLY
At a CURTISS SCHOOL

The new Curtiss course is now ready. It was prepared for you by civil and military experts. It is standard of each of the 35 Curtiss schools. It is conducted solely by instructors who have taken the special Curtiss Instructors' Course.
In this splendid modern course only the finest equipment is used—including the highest priced training planes.
Avail yourself of this first class training and prepare for a high place in the increasing business of aviation.
CURTISS FLYING SERVICE
81 West 81th Street, New York City

Learn Aviation in New York
the real center of aviation where more than 60% of the industry has its headquarters.
Trained men are needed for the fifty different trades in aviation. Our full courses will equip you for an attractive position.
Free Employment Service
While Training and After Graduation
Institution of Aeronautics
1180 Broadway at 27th st. New York N.Y.

NEW YORK STATE

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The Fairchild School of Flying is a model school for flight instruction not merely another commercial venture. It offers courses designed and personally supervised by a specialist with more than 12 years' experience in flight instruction. Complete equipment including different type airplanes, all of latest design. New Dept. of Commerce flying school requirements will be fulfilled. Unequalled facilities of the modern Fairchild factories available. A wonderful chance for a limited number of students to get the right start in Aviation.

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$8.50 per Lesson — Learn to Fly at our New Airport — $8.50 per Lesson
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ROOSEVELT AVIATION SCHOOL

After the Army pattern—equipment, curriculum, Army-trained instructors. At Roosevelt Field, where Lindbergh, Chamberlin and Byrd hopped from. 45 minutes from Broadway. Dormitory, for resident students, and swimming pool now in progress. Write, N. J. Beets, Jr. Co-Operative Aviation School, Inc., Mineola, L. I., N. Y.

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APPROVED FLYING SCHOOL!

One of the first schools in the United States to be approved by the Dept. of Commerce for all courses including transport pilots flying and ground school. Write for descriptive catalog.

The EMBRY-RIDDLE Co.
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NEW YORK STATE

BUY HO SCHOOLS — AIR TRAILS — SALES & SERVICE

ROCHESTER FLYING SCHOOL
Rochester Airport—at Rochester, N. Y.
PART OF THE **COLONIAL** FLYING SYSTEM

FLYING SCHOOLS — TRANSPORT — AIR TRAILS — SALES & SERVICE

COLONIAL FLYING SCHOOL
Buffalo Airport—at Buffalo, N. Y.
PART OF THE **COLONIAL** FLYING SYSTEM

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COLONIAL FLYING SCHOOL
Utica Airport—at Utica, N. Y.
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Springfield Flying School

We use the new Dept. of Commerce rules as the basis of our school program. Flight and ground school instruction for private, limited commercial, and transport license. Our students receive individualized instruction on five types of open and cabin ships. Ground school courses are complete and include overhaul of Wright J-6 motors.

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OHIO

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Students enrolling at Raven Rock School receive the benefit of their ownhir modern courses, modern equipment and strictly personal attention and supervision. Write for descriptive folder.

Raven Rock Flying School
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80 Acres

Complete primary and advanced ground and flying courses. All equipment and personnel licensed by both State and Federal Departments of Commerce. Write for booklet.

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10-, 20- and 50-Hour Flying Courses leading to Federal licenses conducted at Pitcairn Field "Willow Grove Pa., one of the largest in the East, in midst of ideal flying country. All-year-round school. Modern flying equipment. No liability bond required. Write for illustrated Booklet.

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LUDINGTON
Distributor FAIRCHILD, WACO, KEYSTONE LOENING, *LEARN TO FLY!* Complete flying courses complying with latest regulations of the Department of Commerce. Accurately equip you for private or commercial license. Efficient licensed instructors. Write, phone or wire for complete details.
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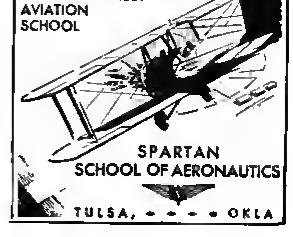

SPARTAN SCHOOL OF AERONAUTICS
TULSA, OKLA

WHERE TO FLY

TEXAS

STUDENT INSTRUCTION
AERIAL SURVEYS
CHARTER TRIPS
"IDEAL ALL-YEAR FLYING"
TEXAS FLYING SERVICE, INC
805 FORT WORTH CLUB BUILDING
FORT WORTH, TEXAS

TEXAS

T-A-T *Flying School*

Train under Veteran Air Mail Pilots

Where Cowboy Kelly got his training

Safe planes—every type necessary to complete your flying experience—ALL NEW. Radio included in ground course for Transport Pilots. License Associated flying schools—perfect flying weather. Address T A T Flying School, 904 Fort Worth Nat'l Bank Bldg. Fort Worth, Texas.
Fort Worth — San Antonio — New Orleans
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Let's go to NEPCO School of Flying

Mile Square Airport
Wisconsin's Largest and Finest Airport and School

8 Hours Free Instruction with every new Fairchild KR-Airplane purchased from us. Limited Commercial Course $750, other courses proportionately. Including 5 hours x/c. Instruction on Ford Tri-Motor Plane.

NEPCO Tri City Flying Service, Inc
Distributors Fairchild Airplanes
Capt. L. G. Walker, Gen. Mgr.
Wisconsin Rapids, Wis.

BEST TRAINING AT LOWEST PRICES

New Lane type equipment, other excellent transport offices. Field with hard surfaced runways. Ten years successful experience in commercial aviation.

SOUTHERN AIRWAYS SCHOOLS
McAllister Bldg., San Antonio, Tex.

IF YOU do not find what you want advertised here, write to Searchlight Dept., Tenth Avenue at 36th Street, New York. You will be put in prompt touch with reliable sources of supply.

Professional Services

SHOWALTER-ASSOCIATES
Airpark
Planners-Architects-Engineers
2220 Park Ave.
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STRESS ANALYSIS
AIRCRAFT DESIGN
AIRPORT CONSULTANTS
PRODUCTION ENGINEERING
HUGH L. THOMPSON CO
2232 Grand Ave. — Kansas City, Mo.

GAZLEY AND LASHA
Consulting Aeronautical Engineers
Bill Building, 17th and I Sts. N. W.
Washington, D. C.
Stress Analysis — Airplane Design

Aeronautical Engineering
Aeroplane Design
Airport and Airline Layout
Stress Analysis—Pilot Layout and Research
By Competent Engineers
S.D. 171, Aviation
520 No. Michigan Ave., Chicago, Ill.

L. H. CROOK
Aerodynamical Consultant
Performances and Stability Calculations
WIND TUNNEL and
Laboratory Tests Made to
1324 Jefferson St. N. W., Washington, D. C.

2 + 2 = 5

Ideas united together do more than simply adhere. They merge, they unite, they take on a new life of their own. They grow and expand. They develop into brilliant discoveries that may revolutionize some field of human activity.

Expose your own ideas to the brilliant action of the ideas of others. There is more than one idea in it, found in this Directory that will revolutionize your business.

AEROTECH, Inc.
Aeronautical Engineering Design
Stress Analysis Reports Appraisals
Complete Testing Facilities
MOLINE, ILL.

ROBERT J. STEWART
Aircraft Supplies
Challenger Airplanes
OX Cylinders Reconditioned
Send for Catalog F
Catonsville — Maryland

The "Searchlight" Advertising in This Paper

is read by men whose success depends upon thorough knowledge of means to an end—whether it be the securing of a good used plane at a moderate price, or an expert pilot.

THE BEST PROOF of this is the variety of the Searchlight ads. Without a constant and appreciable *demand* for such equipment or service, by its readers, the market place which these advertisements represent could not exist for any length of time.

ARE *YOU* USING THE SEARCHLIGHT SECTION?

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD

Positions Wanted, Positions Vacant and all other classifications excepting employment, 10 cents a word, minimum $1.00 an insertion. 15 cents a word if a box number address care of any of our offices is used.

Proposals 40 cents a line an insertion.

INFORMATION

Box Numbers may be in care of our New York, Chicago or San Francisco offices.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed additional (not including proposals).

DISPLAYED—RATE PER INCH

1 to 3 inches — $6.00 an inch
4 to 7 inches — 5.75 an inch
8 to 14 inches — 5.50 an inch

Other spaces and reduced rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

FOR SALE

AERICAN Eagle 1928 like new OX-5 inline 140 hp ground 35 hours 6 months license. Also spare motor with parts all for $2,200. Joseph Barkoncy 500 Hudson St. Harrison, Conn.

AMERICAN Eagle 1928 cheap will take automobile as part payment. John's Auto Repair 241 Nostrand Ave. Brooklyn N. Y.

BARGAINS in used planes. Priced to sell. (4) OX-5 Travel Airs. (1) Lincoln Page. (1) OX-5 Waco 10. (1) J-5 Waco 10. (1) Air King OX-5. (1) 6-place Travel Air monoplane. Hamilton Airport, Inc., Indianapolis, Indiana.

BRAND new Waco model 180 with Hisso motor and Grau Arro Struts. Located in North Dakota, hangar stored. Will sell for less than distributors cost. No trades. Address T. E. Chmaridges, Carrington, N. D.

BRISTOL Jupiter 9-cylinder radial engine 435 horsepower, complete with propeller. $600. Anzani 3-cylinder $150. New Curtiss motors. Write for prices. Glider plan prints $3. Marvin A. Northrop, Aeronca Company, 730 Wash ington Ave., North, Minneapolis, Minn.

CURTISS SEA GULL—Ship complete, rebuilt same as new. Three passenger cockpit, finished in green leather. Powered with 180 hp. Bisnane in condition, wings packed with complete balanced ailerons. Dual control, takes off with three people in eighteen seconds. First $1,500 takes it. Write, wire or call. Sydney Herman, 8923 Byron, Detroit, Mich. Phone Empire 8939.

FORTUNE in airplane sales. Under this plan a salesman should sell at least one Eaglerock a month—a rich monthly income for him at from $1,000 to $1,500. Only two weeks free sales training course gives you ready to get the money. We equip salesmen who qualify with a free demonstrator Eaglerock. You can offer buyers an easy plan of time payments. Write for details. Alexander Aircraft Co., Dept. 11, Colorado Springs, Colo.

FOR SALE

FOR SALE 50 OX-5 motors. Some rebuilt, like new, rest as is. Price range $300-$550. FS 164 Aviation Trade Ave. at 36th Street, New York.

FOR SALE One 60 hp. LeBlond Aircooler cylinder of 60 hp. Velie M-5 engines purchased on large contract. Having now adapted 90 hp. engine as standard on our Golden Eagle airplanes we are willing to sell these smaller engines which are all new, at reduced prices. Golden Eagle Aircraft Corporation, 4115 East Industrial Avenue, Inglewood, Calif.

FOR SALE 1928 Waco 10 NC licensed June 1929, entirely rebuilt motor turns 1,450 on ground. Miller Aero Arms. Perfect condition throughout. $1,775. Flyaway Albany. New York. Albany Air Service.

FOR SALE, licensed OX, Waco 10, excellent condition, OX Standard, two silk Russell chutes, new oil, priced right for quick sale. Charles G. Orull, 348 Main Street, Petaluma, Calif.

FOR SALE Three new Curtiss Reed propellers for J-6 Whirlwinds, one Menasco Salmson Standard steel propeller, one model E 180 hp. Hispano-Suiza motor. The propellers are new and the motors have been reconditioned and recently checked in our motor department. The Stearman Aircraft Company, Wichita, Kan.

FOR SALE Wilson motor, new, 4-place. 50 hours. $7,000, everything is to be perfect, million dollar room in a crash, if any kind. FS 246 Aviation, 520 No. Michigan Ave., Chicago, Illinois.

FOR SALE Jenny OX-5 in A-1 condition. Fly away from Roosevelt Field. Reasonable. Elmer F. James, 387 Jackson St., Hempstead, Long Island, N. Y.

FOR SALE

FOR SALE Aeromarine Moth Monoplane flying time 74 hours, used for pleasure only. Guaranteed to be O.K. Fly away $1,600. Harry Kimmich, Elwood City, Pennsylvania.

FOR SALE one licensed OX-5 Challenger ship rebuilt and recovered by Lafayette Aircraft Corporation. Reason for selling, is owner is buying larger ship. Will demonstrate anytime at Lancaster Aleport, Lancaster, Pa. M. H. Gilbert.

FOR SALE, Swallow with 180 E Hisso motor top overhauled for roundtrip private award, sacrifice $2,250 for quick sale. 150 A Hisso motor completely overhauled, two extra blocks $600. Frank Rayne, 514 East Jack son Street, Muncie, Ind.

FOR SALE Waco Brand new condition or rebuilt Berryhill paint job silver wings, red fuselage and black cowling. Dual control from Hisso Motor new, turns 1,400 on ground. New Horizon propeller. Price $1,475. Now at Packs Airport, East St. Louis, Ill. See P. I. Collins.

GOOD OX-5 Standard, J-1 airplane for sale. Ship completely rebuilt and tested, fly away. Price $500. Sloan Short, Kilbourne, Iowa.

HAMMONDSPORT OX-5 1,425 on ground completely rebuilt and exceptionally good. Silver cylinders, new ignition units, valves etc., all for $425. Howard Snyder, 16 Commerce Street, Hazleton, Penna.

HAVE 1928 OX-5 Challenger would like to trade in on air-cooled job. No junk. Otto Woll & Son, 406 Broad St., Bloomfield, N. J.

LICENSED Pitcairn Fleetwing OX-5 motor new when installed. Ship and motor had 68 hours. Perfect condition. Motor turns up 1,400 on ground. Hartzell propeller. Winds. Floods compass. Wired for navigation lights. Reasonable. FS-217 Aviation, Trade Ave. at 36th Street, New York.

MODEL E Hisso motors $650, model A $450 completely rebuilt. Complete stock of Hisso motor parts, prices reasonable. E. D. Andreson, 130 Grillon Avenue, San Antonio, Texas.

MONOCOUPE for sale or trade—in A-1 condition. Must be sold at a sacrifice at once. Powered by Wright J-6 motor. Write or wire FS 243 Aviation, 520 No. Michigan Avenue, Chicago, Ill.

NEW Irwin meterpiloe Model C-C-1, single seat tractors built ready to fly $975. Also by agent of Dragon Co. Airways, Wurtsboro, N. Y. write Harry Foster, 174 Riverview Ave., Port Jervis, N. Y.

NEW OXX-6 motors in original boxes, very reasonable price. Will ship with privilege of inspection. Grand Marine Motor Company, 2078 St. Clair Ave., Detroit, Mich.

OX-5 LINCOLN PAGE like new flown 75 hours, motor turns 1,400, ready to fly $1,850. R. C. Brooks, 1802 Ressler Blvd., Indianapolis, Ind.

[Continued on page 611]

AUCTION

Sale of Navy Surplus and Surveyed Material

BY PUBLIC AUCTION
AT THE
NAVY YARD, PHILADELPHIA, PA
10:00 A.M.

SEPTEMBER 24, 1929

The following material will be offered:

6,150,500 lbs. (approx.) Ferrous Metals
600,000 lbs. (approx.) Non-Ferrous Metals
3,000 ft. (approx.) Wire

Radio Material
Recd Instruments
Furniture
Lathes
Trucks
Piano
Electrical Material
Aeronautical Material
Motor Generators
Trucks
Lumber
Hardware

100 LIBERTY ENGINES
Small Tools and Many Other Items

The auctioneer for this sale will be Geo. Ekelberry, 402 Pennsylvania Avenue, N. W., Washington, D. C. Catalog 850-A containing all available details and description, terms of sale, etc., and may be obtained from the Supply Officer, Navy Yard, Philadelphia, Pa., or the

Bureau of Supplies and Accounts
Navy Department, Washington, D. C.

RYAN B-1

Nearly new 1928 model. Flown only fifty hours. Brakes, tail wheel and fully equipped. Cost $12,500 delivered. Price $8,000 cash, free delivery.

SPEAR FOLKS
495 Congress Street, Portland, Maine

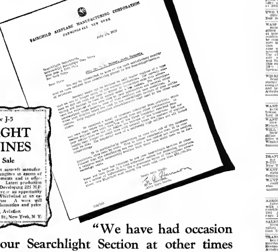
FOR SALE

American Eagle, flown less than 75 hours, OX-5 Motor just rebuilt, all perfect condition. $2,100. American Eagle A-1 condition OX-5 Motor flown 24 hours, three brings rebuilt $1,500. Both planes fully equipped and licensed. Exhibition Parachute perfect condition, used only three drops. $450.

FORTH SMITH AIRCRAFT CO.
711 Garrison Ave., Fort Smith, Ark.

An $18.00 ad that produced sales of more than $36,000.00

Read the letter



This is the ad that sold 12 engines worth more than $36,000.00

New J-5

WRIGHT ENGINES

For Sale

One of the largest aircraft manufacturers has a few engines in excess of production requirements and is offering them for sale. Latest production and never used. Developing 225 H.P. at 1800 r.p.m. Here is an opportunity to secure a new Whirlwind at an exceedingly low price. A wire will bring complete information and price.

F. S.-52, Aviation
Tenth Ave. at 36th St., New York, N. Y.

"We have had occasion to use your Searchlight Section at other times and have found it a most effective medium for producing inquiries"

Turn YOUR used and surplus equipment into CASH. Mail a list of the equipment you have for sale to the Searchlight Department and let us tell you exactly how much it will cost to advertise it. Address: SEARCH-LIGHT DEPARTMENT, Tenth Avenue at 36th Street, New York City.

FOR SALE

(Continued from page 59)

PARACHUTES new and used, rope ladders for stunt men, etc. Specify weight. Thompson Bros. Balloon and Parachute Co. Aurora, Illinois. Established 1885.

RYAN Brougham J-5 motor overhauled at 200 hours, repainted. This ship is in first-class shape, real buy at $7,000. Travel Air Hisso 180 E with Scintilla mags, steel prop, instruments in both seats, bank and turn, brakes. Motor turns 1,500 on ground. Price $3,000. Travel Air OX-5 in first-class shape. Has just been recovered. $2,500. Waco 10 OX-5 has 80 hours on ship and motor, turns 1,460. Price $2,500. C. A. Stearns, 421 Fourth National Bank Building, Wichita, Kansas.

SPECIAL 180 Hisso-Eaglerock, practically new, located in New York City. Must be disposed of for financial reason. First reasonable offer accepted. FS-242, Aviation, Tenth Ave. at 36th Street, New York.

TWO Waco tens with OX-5 motors. Good condition. Government license. Price 1,800 each. Dale Seitz, 200 No. 18th St., Kansas City, Kan.

WASP motors for sale, nine (9) B type Wasp motors with C type valves in perfect condition. All have been thoroughly overhauled at intervals of less than 200 hours in our fully equipped shop at Oakland. Each motor will be completely overhauled just prior to sale to insure purchaser receiving motors in A 1 condition. Total time on motors varies and in each case sale price will be adjusted or pro rated according to time charged against each motor. Use of larger motors prompts this sale. For sale at same time Hamilton Wasp propellers and Star compasses. Those interested may hold this equipment for future delivery upon making 25% deposit. Pacific Air Transport (Boeing System), Oakland Airport, Oakland, Calif.

WHIRLWIND Waco J-5 earlier. Good as new. Bendix wheels and brakes, hand inertia starter, steel propeller, aero struts, baggage compartment, air speed indicator, compass, bank and turn indicator. Cheap for cash. FS-234, Aviation, 520 No. Michigan Ave., Chicago, Ill.

EQUIPMENT WANTED

WANTED Waco 10 OX-5 motor near Lansing, government licensed, never cracked up. State lowest price cash. M. Fisher, 737 South Hayford Street, Lansing, Mich.

WANTED—2 Engines Orientators. State condition and lowest cash price at once. Rodeghier Motors, Joliet, Ill.

WILL pay cash for airplanes, motors, propellers, instruments and airplane parts in any condition or quantity. Send complete details and price wanted in first letter. R. J. Russell, 5815 Winthrop Ave., Chicago, Illinois.

POSITIONS VACANT

DRAFTSMAN wanted, layout and detailer with not less than 3 years of aircraft experience. P-237, Aviation, Tenth Ave. at 36th Street, New York.

WANTED Draftsman, unusual future for the right man to work up. Lenert Aircraft Company, Pentwater, Mich.

WANTED transport pilot, instruction and cross-country. Permanent for right man. Dependable. Robbins Flying Service, Akron, Ohio.

POSITIONS WANTED

AERONAUTICAL engineer on design and structures available September 15. Competent and with approved type airplane to credit. Will consider temporary or permanent position. PW-244, Aviation, 520 No. Michigan Ave., Chicago, Illinois.

SALES engineer earning $100 a week, 30, university graduate, married, wishes connection, salary no object. Make offer. PW-245, Aviation, 520 No. Michigan Ave., Chicago, Ill.

TRANSPORT pilot, 7 years' experience, 1,800 hours cabin and open ships, 2 years college, married, desires change, employed at present. Licensed mechanic, sales experience. PW-230, Aviation, 520 N. Michigan Ave., Chicago, Ill.

TRANSPORT pilot wishes position, private or commercial. Experienced as instructor and in all branches of flying. Am now flying steadily. Clarence O. Snyder, 108 McCormick Ave., Syracuse, N. Y.

TECHNICAL SERVICE
217 Broadway, New York City
Specialists in Technical Personnel
CHEMICAL ELECTRICAL CIVIL
MECHANICAL AVIATION

POSITIONS WANTED

TRANSPORT pilot, 23, single, Navy trained, university graduate civil engineer, 640 hours military and commercial types, landplanes and seaplanes, will go anywhere. PW-243, Aviation, 520 No. Michigan Ave., Chicago, Ill.

TRANSPORT pilot, 500 certified hours, never cracked, wishes position with possible advancement. Single, 24 years old, will go anywhere, references. Available at once. Geo. L. Thorpe, 1210 21st St., Rock Island, Ill.

TRANSPORT pilot, plenty of experience as instructor, test pilot, cross country, manager of airport. Wish position with reliable concern. What have you to offer. PW-247, Aviation, 520 No. Michigan Ave., Chicago, Ill.

Experienced Aeronautical Engineer

Capable of taking complete charge of small plant. 18 years' aviation experience, general. Many proven airplanes of my design and construction in use. Well experienced on all design and stress calculations. Would consider development of airplane, both design and construction, for commercial market. All design and construction to Department of Commerce requirements. I will only connect with first class party or organization who are financially capable and responsible.

Aeronautical Engineer
Box 115, Hillsgrove, R. I.

ADVERTISING EXECUTIVE

Young man, ex-pilot, thoroughly familiar with the technical aspect of aeronautical advertising and with the layout, design and purchase of efficient office forms, is available for appointment Sept. 15th.

This man can substantially reduce your present printing costs and augment the value of your advertising appropriation.

For detailed information, address inquiries to

PW-250, Aviation
Tenth Ave. at 36th St., New York City

Officer in the Swedish Air Force on duty until October 8th wants flying position for eight months—instruction, cross country, etc.—in order to study American Civil Flying. Transport License (land and seaplanes). Salary and place no object.

PW-248, Aviation
Tenth Ave. at 36th St., New York City

WANTED
Position by Able Executive
Former Pilot and Army Air Corps Officer well known to the industry who has had eighteen years aeronautical experience in clothing—production, inspection, purchasing, selling, etc. Now engaged in aviation but would consider connection with reliable firm. Address
P. O. Box 68, Washington, D. C.

POSITIONS WANTED

YOUNG man, 10 years experience on automobiles, wishes position in aeronautical motor factory near New York. P. Cono, 1575 West 11th Street, Brooklyn, N. Y.

BUSINESS OPPORTUNITIES

PARTNER wanted with $900 cash on plane to be flown from Roosevelt Field L. I., student considered. BO-228, Aviation, 10th Ave. at 36th St., New York.

MISCELLANEOUS

ATTENTION Aviators. Valve guides installed on OX cylinders, $1.50 per guide, removable valve seats installed, $1.00, descriptive literature upon request, all work guaranteed. Illinois Flying Co., New location 4 West 4th St., Sterling, Ill.

ATTENTION. Special sale on dope. Clear nitrate $1.70 per gal. Alum. pigmented $3.00 per gal. Brevlid pigmented $4.00 per gal. "A shrink in every drop." Let us dope out your dope problems. Scott Wright, Box 135, Vandalia, Ohio.

REBUILD your OX5 with removable graphite guides, inserted seats and oversize valve action, also OX5 and Hisso parts. Write for circular. Herkmon Machine Works, 4025 West Lake Street, Chicago, Illinois.

AVIATION—Salary while learning, $18 to $35 per week while under instruction in our factory and shops. Call or write for information without obligation. AERO CORPORATION OF AMERICA, Department AV, 63 Second Street, Milwaukee, Wisconsin.

Learn Welding

LEARN WELDING and lead burning in the best equipped school in St. Louis, day and evening instruction, no classes, each student has unlimited personal instruction, no time limit. Full course on all the common metals, including aeronautical tubing, only $100. Get your money's worth. Aeronautical Engineering Company, 2903 Shenandoah Ave., St. Louis, Mo.

. . . . Opportunity to Buy

Cabin Plane and Design

One of the leading commercial aircraft manufacturers has an 8-place cabin monoplane, with design and engineering data, less Wright J-5 motor, for sale. The design is by a nationally recognized aeronautical engineer. The ship has been satisfactorily test flown and only the manufacturer's decision to concentrate in the small ship field prevents it being placed in production. This is an attractive purchase for a manufacturer who wishes to enter the cabin field with most research completed or for a newly incorporated company wanting something tangible to offer its stockholders. Priced for immediate action.

Box FS-172, Aviation Magazine
Tenth Ave. at 36th St., New York City

ALPHABETICAL INDEX TO ADVERTISEMENTS

SEARCHLIGHT

AIRCRAFT SERVICE DIRECTORY

LOOK
for this pledge of
DEPENDABLE FLYING POWER

This Pratt & Whitney trademark is conspicuous upon every "Wasp" and "Hornet" engine. It is a pledge of dependable flying power. Look for it when you travel by air.

Experienced pilots will tell you this trademark represents millions of safe, comfortable and swift miles through the skyways of the world with passengers, mails and merchandise.

They will explain that it typifies abundant power to maintain exacting schedules night and day even under the most difficult conditions.

They will point out that engines bearing this insignia hold more than twice as many records of "utmost performance" as are accredited to the products of any other American manufacturer.

You, as a patron of aerial transportation, are surely wise to rely upon the experience of these experts...You are wise to journey always with the finest power equipment known to modern aeronautics.

THE
PRATT & WHITNEY AIRCRAFT CO
HARTFORD · · · CONNECTICUT

DIVISION OF THE UNITED AIRCRAFT AND TRANSPORT CORPORATION

Wasp & Hornet
ENGINES

Manufactured in Canada by The Canadian Pratt & Whitney Aircraft Co., Ltd., Longueil, Quebec; in Continental Europe by the Bavarian Motor Works, Munich